SETTLEMENT AGREEMENT BETWEEN UNITED STATES, ON BEHALF OF THE GENERAL SERVICES ADMINISTRATION, AND SHELL OIL COMPANY

I. Introduction

1. The United States, on behalf of the General Services Administration ("GSA"); Shell Oil Company, and Motiva Enterprises, LLC (the "Shell Entities") (collectively referred to herein as the "Parties") enter into this Settlement Agreement.

2. This Settlement Agreement concerns a parcel of land comprising approximately 11 acres in Washington, D.C. bordered by M Street, SE, to the north, by Fourth Street, SE, to the east, by Tingey Street to the South, and by the line of New Jersey Avenue to the west (hereinafter, the "DOT Parcel").

3. The DOT Parcel was formerly owned by GSA. GSA discovered that soil and groundwater at the DOT Parcel was contaminated with unused petroleum products, their additives and derivates, and other contaminants.

4. On July 14, 1999, the United States Environmental Protection Agency ordered GSA, pursuant to Administrative Order No. RCRA-III-019AM, to perform a Corrective Action to address soil and groundwater contamination at the DOT Parcel. Under the Administrative Order, GSA incurred cleanup costs.

5. On February 1, 2002, GSA entered into a fifteen (15) year lease with JBG/Federal Center, LLC. ("JBG") for the United States Department of Transportation ("DOT") Headquarters Building. During construction of the DOT Headquarters Building, GSA contracted with and paid JBG for the costs of site remediation as well as all additional costs for design and construction related increases incurred as a result of and in connection with the contamination of soil and groundwater. Excavation for the construction of the DOT Headquarters Building occurred on the DOT Parcel, which was owned by the United States through GSA. On September 18, 2006, GSA closed on the sale of the DOT Parcel to JBG.

6. GSA has retained access to the DOT Parcel for the purposes of carrying out the Administrative Order, and continues to perform environmental cleanup work on the DOT Parcel.

7. The United States alleges that the Shell Entities are liable for investigation costs, cleanup costs and excess construction costs incurred as a result of the Contamination of soil and groundwater with unused petroleum products and its additives and derivatives at the DOT Parcel.

8. The Parties enter into this Settlement Agreement in order to avoid the risks and expense of litigation and in the belief that resolution of this dispute without litigation is in the best interests of both Parties. This Settlement Agreement does not constitute an admission of any issue of fact or law.

II. Parties Bound

9. The provisions of this Settlement Agreement shall apply to and be binding upon the Shell entities and their successors and assigns and upon the United States. Any change in

ownership or corporate or other legal status of the Shell Entities, including but not limited to any transfer of assets or real or personal property, shall in no way alter the Shell Entities' responsibilities under this Settlement Agreement. Each signatory to this Settlement Agreement certifies that he or she is authorized to enter into the terms and conditions of this Settlement Agreement and to bind legally the party represented by him or her.

III. Definitions

10. Unless otherwise expressly provided herein, terms used in this Settlement Agreement which are defined in the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 and the Hazardous Waste and Solid Waste Amendments of 1984 ("RCRA"), 42 U.S.C. §§ 6901-92k, have the meaning assigned to them in RCRA.

a. "Contamination" shall mean the contamination of soil or groundwater at the DOT Parcel with unused petroleum products and its additives or derivatives

b. "Effective Date" shall mean the date described in paragraph 23.

IV. Payment of Certain Costs and Damages

11. Within thirty (30) days after the Effective Date, the Shell Entities shall pay to the United States the sum of two million, one hundred thousand dollars ($2,100,000.00) to reimburse the United States for investigation, cleanup and excess construction cost associated with the Contamination.

12. Payment of the total amount specified in Paragraph 11 above shall be in the form of an electronic funds transfer ("EFT") made in accordance with the instructions attached hereto as Appendix A. At the time such payment is made, notice shall be send to:

Steven P. Richard
Director, Service Delivery Support Division
7th & D Streets, SW
Suite 3360
Washington, D.C. 20407

and to:

Chief of Environmental Enforcement Section
U.S. Department of Justice
Environment and Natural Resource Division
P.O. Box 7611
Washington, D.C. 20044

13. If the Shell Entities fail to make any payment under this Settlement Agreement by the required due date, the Shell Entities shall be in violation of this Settlement Agreement and shall pay, as a stipulated penalty, $500.00 per day that such payment is late. The stipulated penalties are due and payable within 30 days of the date of the demand for payment of the penalties by the United States. All payments under this paragraph 13 shall be identified as "stipulated penalties" and shall be made to the United States by certified check made payable to "U.S. Department of Justice." Such payment shall include, on its face, the following: "Payment for Stipulated Penalties in Accordance with Settlement Agreement between United States and Shell Oil Company dated [Effective Date]." The payment shall also include the Shell Entities' name and address and be mailed to:

Financial Litigation Unit
Office of United States Attorney
555 4th Street, NW
Washington, DC 20530

At the time of payment of any stipulated penalties, the Shell Entities shall send notice of such payment to GSA and to the United States Department of Justice at the addresses set forth in Paragraph 12. Penalties shall accrue as provided in this Paragraph regardless of whether the United States has notified the Shell Entities of the violation or made a demand for payment but need only be paid upon demand. All penalties shall begin to accrue on the day after payment is due and shall continue to accrue through the date of payment. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Settlement Agreement.

14. Payments made under paragraph 13 shall be in addition to any other remedies or sanctions available to the United States by virtue of the Shell Entities' failure to comply with the requirements of this Settlement Agreement. Notwithstanding any other provision of this Section, the United States may, in its own unreviewable discretion, waive payment of any portion of the stipulated penalties that have accrued pursuant to this Settlement Agreement.

15. The Shell Entities shall be liable for attorneys' fees and costs incurred by the United States to collect any amount due under this Settlement Agreement that is not timely paid or to enforce compliance with this Settlement Agreement.

V. Performance of Work by the Shell Entities

16. Commencing on the Effective Date, the Shell Entities shall perform, at their sole expense, the long-term treatment and monitoring activities described in the Revised Long-term Groundwater Treatment and Monitoring Plan attached hereto as Appendix B (hereinafter, the "Plan"). The Shell Entities shall perform such activities as though they were the "Consultant" selected by GSA pursuant to Section 7 of the Plan.

VI. Covenant Not to Sue by the United States

17. In consideration of the payments to be made by the Shell Entities, and except as specifically provided in paragraphs 18 and 19 below, the United States covenants not to sue or take administrative action against the Shell Entities, their successors, or assigns with respect to

the Contamination. This covenant not to sue is not effective until, and is conditioned upon, complete and satisfactory performance by the Shell Entities of their obligations under Sections IV and V of this Settlement Agreement.

18. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Settlement Agreement is without prejudice to, the right to institute proceedings or to issue an administrative order seeking to compel the Shell Entities to perform additional work to address the Contamination, or to reimburse the United States for additional costs of such work, if:

a. conditions at the Site, previously unknown to the United States, are discovered, or

b. information, previously unknown to the United States, is received, in whole or in part,

and EPA determines that these previously unknown conditions or information together with any other relevant information indicates that the Revised Long-term Groundwater Treatment and Monitoring Plan attached hereto as Appendix B is not protective of human health or the environment.

VII. Reservation of Rights by the United States

19. Notwithstanding any other provision of this Settlement Agreement, the United States reserves all rights against the Shell Entities and their successor or assigns with respect to:

a. liability for failure of the Shell Entities to meet a requirement of this Settlement Agreement;

b. criminal liability;

c. liability for damages for injury to, destruction of, or loss of natural resources, and for the cost of any natural resource damage assessments; and

d. liability for any new release(s) occurring after signature of this Settlement Agreement by Shell;

e. liability arising from the past disposal, release, or threat of release on the DOT Parcel of any hazardous substance, pollutant or contaminant other than unused petroleum products and related additives or derivatives; and

f. liability arising from the past, present, or future disposal, release, or threat of release of a hazardous substance, pollutant or contaminant outside of the DOT parcel.

VIII. Covenant Not to Sue by the Shell Entities

20. The Shell Entities hereby covenant not to sue and agree not to assert any claims or causes of action against the United States, including, without limitation, any of its departments,

agencies or instrumentality of GSA, or its employees, agents, or contractors, with respect to the DOT Parcel or this Settlement Agreement.

21. In any subsequent administrative or judicial proceeding initiated by the United States relating to the DOT Parcel, the Shell Entities shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been settled in this Settlement Agreement; provided, however, that nothing in this Section affects the enforceability of the covenants not to sue set forth in Section VI herein.

IX. Public Notice Requirements

22. Final approval by the United States and the effectiveness of this Settlement Agreement are subject to public notice and comment for a period of thirty days after publication of notice of the Settlement Agreement in the Federal Register. The United States reserves the right to withdraw or withhold its consent if public comments disclose facts or considerations which indicate that this Settlement Agreement is inappropriate, improper, or inadequate. The United States shall notify the Shell Entities of such approval or non-approval expeditiously after the close of the applicable public comment period. Should the United States withdraw or withhold its approval, this Settlement Agreement shall be null and void.

X. Effective Date

23. The Effective Date of this Settlement Agreement shall be the date on which GSA issues written notice to the Shell Entities following the public comment period that the United States Department of Justice has approved the Settlement Agreement and that the comments received do not require modification of or GSA withdrawal from the Settlement Agreement.

XI. Entire Agreement

24. This Settlement Agreement contains the entire agreement between the Parties, and no statement, promise, or inducement made by any party to this Settlement Agreement that is not set forth herein shall be valid or binding.

XII. Modification

25. The terms of this Settlement Agreement may be modified only by a subsequent written agreement by the Parties.

XIII. Signatories

26. Each undersigned representative of Shell and the United States certifies that he or she is fully authorized to enter into the terms and conditions of this Settlement Agreement and to execute and legally bind such Party to this document.

IN WITNESS WHEREOF, the Parties have executed this Settlement Agreement on the dates hereinafter written.

FOR THE SHELL ENTITIES:

SHELL OIL COMPANY
By: SHELL OIL PRODUCTS COMPANY, LLC
Its Agent

Dated: 07/30/08

By: _____
David A. Sexton, Director

MOTIVA ENTERPRISES, LLC

Dated: 08/06/08

By: _____

FOR THE UNITED STATES:

12/30/08
Dated

RONALD J. TENPAS
Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice

1/21/2009
Dated

DANIEL S. SMITH
Trial Attorney
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611, Ben Franklin Station
Washington, D.C. 20044-7611
601 D Street, NW
Washington D.C., 20004
Phone: 202-305-0371
Fax : 202-616-6583

FOR THE GENERAL SERVICES ADMINISTRATION:

	1/09/09
	Dated

APPENDIX A

FEDWIRE Electronic Funds Transfer
To The
U. S. Department of Justice

To: Responsible Party

In order for you to transfer funds electronically to the Federal Reserve/U. S. Treasury Department in New York City for credit to the U. S. Department of Justice, the following information must be provided to the bank from which the funds are to be transferred. This information will enable the sending bank to complete those fields associated with the beneficiary bank of a *"Fedwire Structured Third Party Format"* electronic funds transfer

ITEM	DESCRIPTION	CODING INFORMATION FOR FEDWIRE FORMAT
2	Receiving Bank ABA Code	----------
3	Message Type Code	------
7	Wire Amount	**$2,100,000.00**
-----	Receiving Beneficiary Bank, Name & Account No.	TREAS NYC/CTR/BNF=DEPT OF JUSTICE/----------
12	Required Beneficiary Information: *Collection Office Identifier *Debtor Name *Collection Office Claims	**DC.1** **SHELL** **[CDCS#** - Call Patricia Gilbert to obtain before wiring]

ATTENTION COLLECTION OFFICES: Each of the above blank spaces "MUST" be completed before providing this form to the debtor/debtor's attorney. Once completed, the debtor/debtor's attorney must provide this form to the bank from which the funds are to be transferred to ensure that the electronic transfer of funds is accomplished and properly credited to the U- S. Department of Justice/Debt Accounting Operations Group.

AUTHORITY: The above information requirements are in accordance with the U.S. Treasury Department "Treasury Requirements Manual/Part 6 - Chapter B000"; Appendix E of the "Federal Reserve Bank Funds Transfer Systems Manual"; and, 31 CFR Part 206 (Federal Register - Vol. 59, No. 20).

Questions regarding this Fedwire EFT should be directed to the responsible Collection Office:

POINT OF CONTACT: Patricia Gilbert
TELEPHONE NUMBER: (202) 514-7211

APPENDIX B

REVISED
LONG-TERM GROUNDWATER TREATMENT AND MONITORING PLAN INTERIM MEASURES FOR DOT PARCEL

SOUTHEAST FEDERAL CENTER
WASHINGTON, D.C.

PREPARED

BY

ENVIRONMENTAL STRATEGIES CONSULTING L.L.C.

JULY 13, 2005

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Acronym List

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene and xylene
CLP	Contract Laboratory Program
CO	Administrative Order on Consent
DCQAP	Data Collection Quality Assurance Plan
DO	dissolved oxygen
DOT	Department of Transportation
EDD	electronic data deliverables
EPA	U.S. Environmental Protection Agency
GSA-NCR	General Services Administration – National Capitol Region
HASP	health and safety plan
HHRA	human health risk assessment
ID	inside diameter
IDW	investigation-derived waste
IM	Interim Measures
µg/l	micrograms per liter
mg/l	milligrams per liter
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
ORC®	Oxygen Release Compound
PSS	Phase Separation Sciences
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAO	quality assurance officer
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RPD	relative percent difference
SEFC	Southeast Federal Center
SOP	standard operating procedure
VOC	volatile organic compound

1.0 Overview

The Southeast Federal Center (SEFC) is a 55-acre property in Southeast Washington, D.C. The property is owned by the U.S. Government and controlled by the General Services Administration, National Capital Region (GSA-NCR). GSA and the U.S. Environmental Protection Agency (EPA) Region III have signed a Final Administrative Order on Consent for the SEFC (Docket Number RCRA-III-019AM, dated August 2, 1999). The Consent Order specifies that the SEFC be investigated in accordance with Section 3013 of the Resource Conservation and Recovery Act (RCRA). An 11-acre parcel within the SEFC (the "DOT parcel") will be the location of a new U.S. Department of Transportation (DOT) headquarters building. The building footprint will cover 8 of the 11 acres of the DOT Parcel.

The Consent Order specifies that the entire SEFC is subject to the terms and conditions of the Consent Order, including the DOT parcel. In a letter, dated January 25, 2002, EPA Region III approved GSA-NCR's approach of conducting a separate RCRA Facility Investigation (RFI) for the DOT parcel. The RFI soil and groundwater quality investigations were conducted in 2002. GSA-NCR submitted a draft RFI Report to EPA Region III in August 2002. After receiving and responding to EPA comments, the final RFI Report was submitted to EPA in March 2004.

The Consent Order also provides for the implementation of Interim Measures (IMs) to mitigate releases of hazardous wastes and/or hazardous constituents. Criteria for conducting IMs at the SEFC are described in Section VI-B, Paragraphs 33 through 37 and Attachment C of the Consent Order. In a letter dated, August 16, 2002, EPA Region III agreed that soil and groundwater remediation of the DOT parcel could be conducted in accordance with the IM provisions of the Consent Order. An IM Work Plan was submitted to the EPA on August 4, 2003. The IM Work Plan addresses the areas of contaminated soil and groundwater on the DOT parcel identified by the RFI. EPA conditionally approved the IM Work Plan in a letter, dated October 2, 2003.

The IMs were implemented in accordance with the IM Work Plan during 2003 and 2004. The implementation of the IMs is described in the draft IM Implementation Report submitted to EPA in November 2004. JBG/Federal Center, L.L.C., is developing the DOT Parcel. JBG/SEFC Associates, L.L.C., acted as an agent for GSA-NCR for the remediation work. After EPA issues a final Decision Document for the DOT Parcel, GSA-NCR will transfer the DOT Parcel to

JBG/Federal Center L.L.C.. GSA-NCR will remain responsible for implementing the treatment and monitoring activities described in this Long Term Groundwater Treatment and Monitoring Plan Interim Measures for DOT Parcel.

As part of the IMs, a human health risk assessment (HHRA) was conducted at the DOT Parcel and included as Appendix O of the IM Implementation Report. The HHRA was conducted to estimate the potential carcinogenic and non-carcinogenic risks from soil and groundwater remaining at the site after the IMs were completed. The DOT building will be a commercial office building and this use is not intended to change for the foreseeable future. However, in accordance with EPA accepted risk assessment procedures, the potential future residential use of the site was also evaluated in the HHRA.

Under the exposure scenarios presuming DOT Parcel use as a commercial office building with retail space in neighboring buildings, the risk assessment showed that the potential cumulative carcinogenic human health risks to employees and their dependents from soil and groundwater are within the acceptable range. The noncarcinogenic risks are also acceptable. Therefore no additional action is required at this time to protect the occupants of the DOT Building and neighboring buildings on the DOT Parcel, dependents in an onsite day care center, construction workers, or visitors to the site.

However, the objective of reducing the risk to potential future residential receptors to meet EPA guidelines has not yet been achieved. The groundwater underlying the site does not meet drinking water standards and is unsuitable for human consumption. The HHRA estimated that the potential cumulative carcinogenic human health risk to a future residential receptor is greater than 1 in 10^{-4}if groundwater from the site is used as a potable water supply. Therefore, a groundwater use restriction will be recorded with the property deed. The use restriction will state that groundwater beneath the property shall not be used for any purpose other than environmental monitoring, remediation, and testing.

The HHRA indicates that there is a potential cancer risk greater than 1 in 10^{-4} to potential future residents even when a groundwater use restriction is in place, due to intrusion of volatile organic compounds (VOCs) such as benzene into indoor air. Therefore, additional monitoring and evaluation are warranted, and remediation must be conducted before the property can be used for residential purposes. After construction of the DOT Building, groundwater containing benzene, toluene, ethylbenzene and xylene (BTEX) concentrations greater than the groundwater cleanup

goals will continue to flow onto the DOT Parcel. This Long Term Groundwater Treatment and Monitoring Plan Interim Measures for DOT Parcel describes the additional groundwater monitoring, evaluation and treatment that will be conducted on the DOT Parcel to address the groundwater containing BTEX.

The groundwater cleanup goals for the DOT Parcel are the EPA maximum contaminant levels (MCLs). If MCLs prove to be technically impractical to achieve, alternate cleanup goals will be developed and approved by EPA. This long-term plan will continue until groundwater monitoring demonstrates that the cleanup goals have been achieved.

1.1 Facility Background

1.1.1 Location and History

A comprehensive summary of the history of the SEFC and the DOT parcel is included in the Description of Current Conditions and Summary of Interim Measures/Site Stabilization (DCC&IM/SS, URS April 2001). This section presents a brief overview of the DOT parcel location and history.

The SEFC is a 55-acre parcel of land located in southeast Washington, D.C., along the northern bank of the Anacostia River (Figure 1). The SEFC property was formerly a complex of weapons production factories and workshops that were part of a larger facility known as the Washington Navy Yard. The site is bounded on the south by the Anacostia River and on the west by the District of Columbia Water and Sewer Authority Main Sewage Pumping Station and by First Street, SE. Industrial, warehouse, residential, and retail properties are west of First Street, SE. The property is bounded to the north by M Street, SE, and on the east by the Washington Navy Yard. The north, east, and west property boundaries are secured with chain link fencing. A concrete and steel seawall on the southern border runs along the Anacostia River.

The DOT parcel is an 11-acre portion of the SEFC (Figure 2). The DOT parcel is bordered by M Street, SE, to the north, by Fourth Street, SE, to the east, by Tingey Street to the south, and by the line of New Jersey Avenue to the west. The DOT headquarters building will be constructed on approximately 8 acres on the north side of the parcel.

The site formerly contained buildings and paved surfaces. Former Navy Yard buildings

within the DOT parcel included factories and workshops for weapons production and ranged from 1,000 to 300,000 square feet in size. The buildings were abated and demolished as part of a redevelopment plan for the site, except for Building 170. The redevelopment plan for the remaining 44 acres calls for mixed-use development under a public sector/private sector collaboration.

The surrounding properties consist of mixed industrial, warehouse, public and private housing, and vacant land. Industry and warehouse make up the largest portion of land use and are intermixed with residential areas. A large concentration of public housing is located in the vicinity of this site. The major landowners include the U.S. Navy, the National Capitol Housing Authority, District of Columbia Department of Environmental Services, and the District of Columbia Department of Parks and Recreation.

Before 1800, water covered most of the land that now comprises the SEFC. Shipbuilding activities began in the early 1800s. In 1803, President Thomas Jefferson designated the Washington Navy Yard the homeport of the U.S. Navy. Activities at the Navy Yard increased including the expansions and construction of wharves, warehouses, and refineries. Later ordnance research laboratories were added. In the early 1900s, the Navy Yard activities shifted from shipbuilding to gun mechanisms and ordnance manufacturing and repair. The manufacturing operations required larger buildings, which resulted in the filling in of marshes and inlets. By 1919, the Navy Yard had expanded to twice its size. The buildings included a range from small warehouses to large foundries. The Navy Yard was capable of producing a 16-inch gun barrel, 43 feet long, weighing 127 tons. A railroad system transected the site for the transport of bulk and refined materials. Under President Franklin D. Roosevelt, the Navy Yard was the main facility for ordnance production and damaged vessel repair. By 1962, ordnance production and manufacture had ended when missiles and electronic equipment made it obsolete. Specific activities conducted in buildings formerly on the DOT parcel included gun barrel manufacturing (Building 153), metal stock storage (Building 205), and supply storage (Building 216). The remaining structure on the DOT parcel, Building 170, was an electrical substation.

In 1963, the Department of the Navy transferred the western portion of Navy Yard to the GSA to develop the SEFC for housing a variety of government facilities, including light industrial operations, laboratories, warehouses, and administrative offices. Since this time, the

GSA has been working on a plan to develop the SEFC to accommodate up to 30,000 federal employees, creating a major federal employment center.

1.1.2 Geology and Hydrogeology

Regional and local geology/hydrogeology information has been collected from previous investigation reports and literature on local geology/hydrogeology (URS 2002, K&D 1991, WCFS 1996). The DOT parcel is located within the Atlantic Coastal Plain Physiographic Province, which is characterized by sequences of marine and terrestrial sedimentary deposits. In general, the Coastal Plain Province consists of an eastward-thickening wedge of unconsolidated gravels, sands, silts, and clays that have been deposited upon an eroded crystalline basement rock surface that slopes downward towards the east. Many depositional environments existed during the formation of the Coastal Plan. Glacially influenced marine transgressions and regressions, periods of erosion and deposition, fluvial (riverine) processes, and structural deformations have all played a part in the evolution of the Coastal Plain. As a result of these varying processes, the presence, thickness, and lateral continuity of geologic formations are highly variable.

The shallow subsurface at the property consists of fill. Beneath the fill materials, two primary geologic units were identified during previous investigations at the DOT parcel. The uppermost geologic unit is comprised of Quaternary age river terrace deposits of interbedded gravel, sand, silt, and clay. The river terrace deposits were found to unconformably overlie the denser interbedded Cretaceous sands and clays of the Potomac Group. Based on logs of soil borings installed at the property, general descriptions of each stratum, from the ground surface downward, are as follows:

- Fill (Stratum F) — Development of the SEFC has resulted in significant excavation, dumping, construction and demolition, and significant filling to create the present surface. Fill is generally composed of inorganic sands, silts, and clays obtained from nearby materials. The fill encountered at the SEFC often includes construction and demolition debris, particularly within former building footprints. Fill has also been placed in the former canal located between Canal Street and 2nd Street, in areas of former and current utilities and within former in-ground structures. Fill thicknesses on the DOT parcel range up to approximately 20 feet.

Fill was generally thickest in the northeast portion of the DOT parcel and in north portions of the former canal.

- Terrace Clays (Stratum TC) — Terrace clays are generally soft to very stiff, red-brown or gray-brown, clays and silts. The terrace clays were found over a large portion of the DOT parcel and are sometimes interbedded with terrace sands (Stratum TS). The terrace clays range in thickness from less than 1 foot to approximately 35 feet in the northwestern and far southwestern corner of the DOT parcel.
- Terrace Sands (Stratum TS) — Terrace sands are generally loose to very dense, red-brown to gray-brown, fine to coarse sands with very little silt. The lower portions of the terrace sands, near where they unconformably overlie the Potomac Group sediments, are coarser than the upper portion and often contain gravel or predominantly consist of gravel and cobbles. The terrace sands are up to 30 feet thick, and were found over a large portion of the DOT parcel, sometimes interbedded with the terrace clays. The terrace sands appear to be more predominant than the terrace clays within the DOT parcel.
- Potomac Clays (Stratum PC) — Potomac Clays are generally very stiff to hard, red-brown to gray-brown clays and silts with occasional pockets of sand. The Potomac Clays are often interbedded with the Potomac Sands and are generally more extensive than the sands. The clays range in thickness from less than 1 foot to greater than 40 feet. The top of the uppermost Potomac Clay layer within the DOT parcel is located approximately 30 to 35 feet below mean sea level (msl), (40 feet below ground surface [bgs]) and acts as a confining layer. In general, the uppermost Potomac Clay layer gradually grades with increasing depth from a clay to a silt, to a sandy silt before grading to the underlying Potomac silty sands and sands. The uppermost Potomac Clay layer ranges in thickness from 10 feet to greater than 40 feet over most of the DOT parcel. Historical boring logs indicate the uppermost Potomac Clay layer to be as thick as 2 feet in the far southwest corner of the DOT parcel. Previous studies indicate that the uppermost Potomac Clay layer pinches out south of the DOT parcel.

- Potomac Sands (Stratum PS) — Potomac Sands within the DOT parcel are generally dense to very dense, gray, greenish-gray and brownish-gray, fine to medium sands and silty sands with a few zones of fine to coarse sand. The Potomac Sands are often interbedded with stratum PC and appear to be more extensive than the clays in the eastern portion of the DOT parcel. The sands range in thickness from less than 1 foot to greater than 50 feet.

The Atlantic Coastal Plain hydrogeology is characterized by numerous water-bearing zones consisting primarily of sands and gravels, separated by less permeable zones of silts and clays (aquitards). According to previous environmental investigations, the hydrogeology in the vicinity of the DOT parcel is characterized by the sandy units of the river terrace and Potomac group deposits. Based on boring logs and water level measurements, the sandy units beneath the site are separated by the uppermost layer of Potomac group clays and silts. This layer acts as a confining aquitard, resulting in two aquifers: the unconfined shallow aquifer, and the confined deep zone aquifer consisting of Potomac group sands and silts. On the DOT parcel, the aquitard ranges in thickness from 10 feet to greater than 40 feet over most of the site. Boring logs indicate the uppermost Potomac Clay layer to be as thick as 2 feet in the far southwestern corner of the DOT parcel. Previous studies indicate that this aquitard pinches out just south of the DOT parcel.

Groundwater elevations in the majority of the onsite monitoring wells (both deep and shallow) range from approximately 5.5 feet above msl to 5.5 feet below msl, or approximately 15 to 25 feet bgs. Based on the local topography, the flow of shallow groundwater would be expected to be towards the Anacostia River, located south of the DOT Parcel. Previous environmental investigations have documented that the upper water-bearing zone flow direction was to the south-southwest up to approximately 1996. The distribution of groundwater contamination from a former Shell station north of the site (discussed in Section 1.1.4) also indicates that shallow groundwater flowed to the south. However, recent groundwater level measurements indicate that groundwater in the shallow zone currently flows towards the west and northwest. For example, during weekly water level measurements in April and May 2003, shallow zone groundwater flowed towards the west and northwest (URS 2003). Shallow zone groundwater contour maps from April and May 2003 are provided in Appendix A. These

contour maps were developed before the start of construction dewatering for the DOT Parcel. Construction dewatering significantly altered groundwater elevations and groundwater flow patterns. However, the DOT Building does not have a permanent foundation drain and groundwater elevations will rise after construction dewatering is finished. The groundwater flow patterns observed in the shallow zone groundwater contour maps in Appendix A are expected to resume when construction dewatering is finished.

Recent groundwater conditions in the shallow zone at the DOT parcel may be attributable to a combination of one or more of the following factors:

- The majority of the site and much of the surrounding area is paved or covered with structures, thereby limiting recharge to the shallow groundwater zone.
- Construction dewatering for properties in the vicinity of the DOT Parcel altered groundwater flow patterns. Dewatering occurred for the Navy Yard Metro Subway Station, located immediately northwest of the site. Construction dewatering for the 300 M Street building immediately north of the DOT Parcel began in December 1998. According to Potomac Properties, the developer of 300 M Street, the building was constructed with a foundation drain, which continues to affect groundwater flow in this area. Since 2002, construction dewatering and the permanent foundation drain at Federal Gateway building (150 feet northwest of DOT Parcel) has lowered the water table 15 to 20 feet, causing shallow groundwater flow to the north and west. This is a significant contributor to the change in groundwater flow direction observed in 2002 and 2003.
- Two large combined sanitary/storm water sewer tunnels are present in the western portion of the site beneath former Building 216 and south of the former Building 216. Investigations conducted for the installation of the metro system indicated that groundwater elevations in the immediate vicinity of the combined sewer along New Jersey Avenue were 2 feet lower than in the surrounding zone (Mueser et al. 1985). Shallow zone groundwater contour maps from January and March 2002 indicate that groundwater in the shallow zone flows towards the intersection of M Street and New Jersey Avenue, indicating that the combined sewer is a potential discharge area.

- Broken water supply pipes and sewers, common in urban areas with aging infrastructures, may act as artificial recharge areas that locally affect groundwater flow. According to Washington Metropolitan Area Transit Authority personnel, water leaking into the Navy Yard Metro station contains fluoride concentrations similar to the fluoride concentrations in local drinking water.

During the RFI, aquifer testing was completed on DOT parcel monitoring wells to characterize the hydraulic properties of the shallow groundwater zone and evaluate the interaction, if any, between the shallow and deep groundwater zones. From the hydrogeologic investigations, URS (2002) concluded that the upper water-bearing zone is under water table conditions and the lower water-bearing zone is under confined and possibly artesian conditions within the limits of the DOT parcel. Based on the aquifer tests for monitoring wells BC-MW18, BC-MW19, and BC-MW20, the estimated hydraulic conductivity for the upper water-bearing zone is in the range of 1.3 to 1.5 x 10^{-2} centimeters per second.

1.1.3 Regulatory Framework

The IMs are being conducted under the July 1999 Administrative Order on Consent (CO). The work described in this plan is consistent with RCRA regulations and the CO.

1.1.4 Groundwater Area of Concern

The IM Work Plan identified one groundwater area of concern on the DOT parcel, a shallow groundwater contaminant plume extending from the former Shell gasoline station located at the northwest corner of M Street and 3rd Street, SE, across M Street onto the DOT parcel. The groundwater contamination is attributed to a release from underground storage tanks at the former Shell gasoline station (District of Columbia Leaking Underground Storage Tank Case 93-085). Six 5,000-gallon underground storage tanks and one 550-gallon waste oil tank were removed from the site in August 1990. Approximately 1,400 tons of petroleum hydrocarbon-containing soils were removed from the former underground storage tank pits in 1991. A soil vapor extraction remediation system operated at the Shell site from February 1995 until September 1998. A request was submitted to D.C. Environmental Health Administration in May 1998 to disconnect the treatment system so the owner could demolish the building. The treatment system was disconnected and the building was demolished. There have been no remedial activities on the site since 1998.

There is an ongoing groundwater monitoring program for the Shell station. The program includes two monitoring wells (MW-13 and MW-14) in the median strip of M Street, to monitor migration of contamination from the former Shell station towards the DOT parcel. Based on the southerly component of groundwater flow, the concentrations observed in samples from MW-14 are expected to be indicative of groundwater that will migrate onto the DOT Parcel in the future. Therefore, MW-14 is being included in the long term groundwater monitoring program (Section 3). BTEX analytical results for groundwater samples from MW-14 are presented in Table 1.

The affected portion of the shallow groundwater zone extends from the former Shell station south across the DOT property. Groundwater throughout this area is at a depth of approximately 16 to 18 feet bgs. Three monitoring wells on the DOT Parcel (BC-MW-02, MW-03, and MW-13) were located in the affected zone. Monitoring well MW-03 on the DOT Parcel was also included in the quarterly groundwater monitoring program for Leaking Underground Storage Tank Case 93-085 from May 1996 until the well was abandoned in 2003. BTEX analytical results for groundwater samples from MW-03 are presented in Table 2.

The groundwater sampling data in the RFI provided a general definition of the affected groundwater. BTEX compounds were not detected in the Area G2 monitoring wells on the eastern part of the DOT Parcel or F1-SB/MW01 on the western part of the DOT Parcel. The lateral edges of the plume are located near the center of former Building 153 and near the eastern side of former Building 205 or 216. BTEX compounds were not detected in wells south of MW-13, and affected groundwater did not extend off of the DOT Parcel to the south.

A more comprehensive groundwater investigation was conducted during the IMs to provide better horizontal and vertical delineation of the affected groundwater. The investigation collected groundwater samples using direct push techniques and traditional monitoring well sampling. The groundwater sampling results from the delineation investigation are provided in Table 3. The horizontal delineation is depicted in Figure 3. The vertical delineation of benzene concentrations along M Street is depicted in Figure 4.

Based on the groundwater quality data from the delineation investigation, five new monitoring wells were installed on the DOT Parcel, four near M Street, and one on the south side near Building 170. DOT-MW-1 was installed at the western edge of affected groundwater near M Street. DOT-MW2S and DOT-MW2D were installed in the center of the affected zone due south

of the former UST locations, southwest of the intersection of M and 3rd Streets. DOT-MW-3 was installed on the east side of 3rd Street, to monitor the eastern side of the affected groundwater. DOT-MW-4 was installed on the south side of the building excavation, to monitor the potential migration of affected groundwater. The wells were sampled after installation, and the results are included in Table 4. The February 2004 groundwater sample from DOT-MW2S contained the highest BTEX concentrations observed to date on the DOT Parcel (32 milligrams per liter [mg/l] benzene and 95 mg/l total BTEX).

Additional soil and groundwater sampling conducted during the IMs indicated that the BTEX concentrations in soil and groundwater declined significantly on the west side of the combined sewer under 2nd Street. It appears that the combined sewer, which intersects the top of the water table, served as a barrier to westward migration of contaminated groundwater. Therefore, DOT-MW-1 is located at the western edge of BTEX-affected groundwater.

1.1.5 Groundwater Interim Measures

The excavation of portions of the DOT Parcel for construction of the DOT Building removed a significant amount of BTEX-contaminated soil and groundwater from the DOT Parcel. Building excavation extended at least 5 feet below the water table, and soil that had been contaminated by the migration of affected groundwater was removed for offsite disposal. A series of dewatering wells were installed around the perimeter of the building excavation for construction dewatering, and several wells were installed within the area of affected groundwater. BTEX-contaminated groundwater was pumped from these wells. Water from these wells was sampled, analyzed, treated with granular activated carbon and discharged to the sanitary sewer. These activities reduced the mass of BTEX present on the DOT Parcel, but did not significantly affect the mass of BTEX upgradient of the DOT Parcel (i.e., under M Street and on the former Shell property).

The delineation investigation groundwater quality data were used to design an enhanced bioremediation program in accordance with the IM Work Plan. The IMs injected oxygen release compound (ORC) into the saturated zone along M Street in March 2004 and placed ORC® in the base of the excavation at different times between May 2004 and September 2004. The ORC® injection and application is described in detail in the IM Implementation Report.

Groundwater monitoring has been conducted since the ORC® injection to monitor the effectiveness of the IM. The analytical results for samples from wells in the monitoring program

are provided in Table 4. Construction dewatering has lowered the water table below the screen interval of several wells in the monitoring program, including DOT-MW2S and DOT-MW-3. No groundwater samples have been collected from DOT-MW2S and DOT-MW-3 since the ORC® injection in March 2004. This has precluded a full evaluation of the effectiveness of ORC® in increasing dissolved oxygen in groundwater and reducing VOC concentrations. The groundwater monitoring data indicates that VOCs have not migrated to other wells during building construction, as VOCs have only been detected in wells where VOCs were detected previously.

1.1.6 Groundwater Cleanup Goals

The EPA has set drinking water MCLs as the groundwater cleanup goals for the DOT Parcel. The MCLs for the contaminants of concern at the site are listed in Table 5. If it is technically impractical to achieve MCLs in groundwater at the site, then site-specific cleanup criteria will be developed to be used as the cleanup goals instead of MCLs. The site-specific cleanup criteria will protect indoor air quality in potential future residential construction on the DOT Parcel. The site-specific cleanup criteria will be developed by EPA in consultation with GSA.

2.0 Long Term Groundwater Treatment

An unknown amount of contaminated soil and groundwater remains on the upgradient gas station property and under M Street. Groundwater migrating onto the DOT parcel may contain VOC concentrations greater than the groundwater cleanup goals until the source of contamination on the gas station property is completely remediated. This section describes the proposed long-term groundwater treatment activities to be implemented to treat contaminated groundwater flowing onto the DOT Parcel. The treatment program described in this section may be modified with the approval of EPA.

The hydrogeological conditions on the DOT Parcel could change temporarily or permanently, due to remedial action or construction activities on the former Shell station property. For example, construction of an office building on the former Shell station property will likely include an underground parking structure that extends into the water table. If the building is constructed with a foundation drain, this could reverse the groundwater flow direction under M Street and prevent additional migration of contaminated groundwater onto the DOT Parcel.

BTEX compounds are readily degraded under aerobic conditions by naturally occurring microorganisms. Biological degradation is often limited by the availability of electron donors such as dissolved oxygen (DO). Groundwater samples collected on the north side of the DOT Parcel before the start of building construction and implementation of the IMs did not contain detectable concentrations of DO (Environmental Strategies, 2004c). Based on the compounds present, the geology, and experience with BTEX contamination in groundwater, oxygen is a limiting factor in degradation of BTEX in groundwater on the DOT parcel. The application of ORC® in accordance with the IM Work Plan increased DO concentrations in groundwater. Section 2.1 describes the IM groundwater treatment activities in more detail.

Environmental Strategies developed a BIOSCREEN groundwater fate and transport model for the migration of contamination onto the DOT Parcel in accordance with IM Work Plan Section 3.1.2 (Environmental Strategies, 2004d). The BIOSCREEN model indicated that with DO constantly present at a concentration of 1 mg/l or more, the benzene concentrations in groundwater will decrease to less than 1 µg/l within 150 feet of the injection point. Therefore, one goal of the treatment program will be to maintain a DO concentration of at least 1 mg/l in

groundwater in the shallow zone. The long-term program will continue until groundwater samples contain VOC concentrations less than the MCLs in Table 5. If it is technically impractical to achieve the MCLs , the groundwater samples will be compared with the site-specific cleanup criteria approved by EPA.

Section 2.2 describes the proposed long-term groundwater treatment program. The long-term program will be similar to the injection conducted for the IMs, except that ORC Advanced™ will be used instead of ORC®. ORC Advanced™ is a calcium-based slow-release product that contains more oxygen and releases oxygen over a longer time period than ORC®.

The long term program will inject ORC Advanced™ into the subsurface along M Street to treat groundwater as it flows onto the DOT parcel. Injections will be conducted under two conditions:

- Groundwater DO concentrations measured in the 'DOT' monitoring wells along M Street are less than 1 mg/l.
- Groundwater flow direction in the shallow zone is towards the DOT Parcel.

If the groundwater flow direction changes, the groundwater monitoring program will continue. Groundwater treatment will be discontinued until groundwater resumes flowing towards the DOT Parcel.

The long-term groundwater treatment program can be modified to incorporate new information and different remediation techniques with the approval of EPA.

2.1 Interim Measure ORC® Applications

The November 2003 groundwater delineation investigation identified the concentration and extent of BTEX present in groundwater along M Street (Figure 3). An ORC® injection program was developed based on the groundwater data from the delineation investigation, as described in a December 18, 2003, letter from Environmental Strategies to GSA (Environmental Strategies 2004b). A total of 5,400 pounds of ORC®, mixed into an aqueous slurry, was injected at 40 points extending nearly 500 feet along M Street (Figure 5). Direct push hydraulic equipment was used to push drive rods to the depths shown in Figure 6, and up to 12 pounds of ORC® per vertical foot were injected into the subsurface as the rods were withdrawn. The ORC® slurry was injected from the bottom of each injection point up to the approximate water table depth during active

dewatering. BTEX were not detected in samples collected from the Terrace Clay; therefore, no ORC® was injected into the Terrace Clay formation.

The IM Work Plan also proposed to mix ORC® into the soil at the base of the excavation. The actual extent of ORC® application in the base of the excavation was based on applying ORC® within the 100-ug/l benzene contour, as shown in Figure 5. ORC® was applied in three parallel trenches, 20 feet wide by 3 feet deep, by excavating 3 feet of native material from the base of the excavation, then backfilling the excavation with stone mixed with ORC®. ORC® was applied in the trenches at a rate of 32 pounds of ORC® per pound of BTEX compounds detected in soil and groundwater at the base of the excavation, as described in the IM Implementation Report. The following rates of ORC® application were used:

- North Trench - 4.1 pounds per square yard of trench surface
- North Trench under 3rd Street – 6 pounds per square yard of trench surface
- Center Trench - 9.7 pounds per square yard of trench surface
- South Trench - 2.7 pounds per square yard of trench surface

The stone backfill in each trench was a coarse aggregate with a maximum diameter of less than 1 inch. Filter fabric was wrapped around the stone to prevent migration of fine particles into the stone. The concrete mud slab and mat slab of the building were then poured over the ORC® trenches.

Additional details on ORC® injection and placement are provided in the IM Implementation Report.

2.2 Long Term ORC Advanced™ Injection

ORC Advanced™ is a proprietary formulation of calcium oxyhydroxide, calcium hydroxide, and calcium carbonate that releases oxygen for up to 12 months. The long term injection program will use ORC Advanced™ instead of ORC® because of its ability to deliver more oxygen per pound of material injected and to deliver oxygen over a longer time period.

The long-term groundwater treatment program will inject ORC Advanced™ at a series of points along the M Street property boundary, similar to the ORC® injection conducted in March 2004 (Section 2.1). The first ORC Advanced™ injection will occur approximately 6 months

after the end of construction dewatering, if dissolved oxygen concentrations in the 'DOT' monitoring wells along M Street are less than 1 mg/l. This will provide time for the groundwater system to return to pre-construction conditions, and time to conduct at least one round of quarterly groundwater monitoring after the end of dewatering. The injection design will be based on the BTEX concentrations and groundwater elevations measured in the groundwater samples collected after the end of dewatering. The injection will form a barrier of oxygen-releasing material in the saturated zone, ensuring that groundwater flowing onto the DOT Parcel contains sufficient dissolved oxygen for BTEX degradation. GSA will consult with EPA in the event that DO levels are not sustained above 1 mg/l between injection times.

ORC Advanced™ will be injected every 12 months, if dissolved oxygen concentrations in the monitoring wells along M Street are less than 1 mg/l and groundwater flow is towards the DOT Parcel. If groundwater samples collected from DOT-MW-1, DOT-MW-2S, DOT-MW2D, and DOT-MW-3 contain DO concentrations greater than 1 mg/l, this would indicate that there is sufficient oxygen present to support continued biodegradation without the use of ORC Advanced. In this case, additional injections are not immediately necessary Groundwater monitoring will be continued, and injections will be resumed if DO concentrations decrease to less than 1 mg/l.

Each injection of ORC Advanced™ will be designed using software provided by Regenesis (ORC Advanced™ Design Software for Barriers Using Slurry Injection, Version 3.2 December 2004). The Excel spreadsheet-based program is used to determine the total mass of ORC Advanced™ to be injected into the saturated zone, the injection rate and the spacing of injection points. The groundwater quality data from the most recent groundwater sampling event will be used as the input data for the model. ORC Advanced™ will be applied at a rate of 18.5 pounds ORC® per pound of BTEX compounds detected in groundwater samples from the "DOT" wells, as recommended by the manufacturer. Sample software output based on the February 2004 data from the "DOT" wells along M Street is provided in Appendix C. The injection design will be submitted to EPA Region 3 for approval at least 1 month before injection.

The maximum horizontal extent of the injections will be from the DOT-MW-1 location to a point 50 feet east of DOT-MW-3. The horizontal extent may be reduced depending on the groundwater monitoring results. For example, if a sample collected from DOT-MW-1 meets the

cleanup goals, then there will be no injection in the DOT-MW-1 area. ORC Advanced™ will be injected for the full depth of the Potomac Sand unit identified during the delineation investigation (Figure 6).

The method to be used for each injection will be based on the status of building construction at the time, the number of injection points, and the desired injection radius.

ORC® injections and groundwater monitoring will be discontinued when the groundwater samples collected from wells DOT-MW1, DOT-MW2S, DOT-MW2D, and DOT-MW3 contain VOC concentrations lower than the MCLs in Table 5 during six consecutive sampling events spread over three years. If it is technically impractical to achieve MCLs, the groundwater samples will be compared with site-specific cleanup criteria approved by EPA. The first of the six sampling events will occur at least 6 months after the last injection of ORC®. After the monitoring data from the six consecutive sampling events has been submitted to EPA, EPA will evaluate whether monitoring should continue on a less frequent basis, or whether monitoring can be discontinued.

3.0 Groundwater Monitoring

Groundwater migrating onto the DOT parcel from M Street and the former Shell station is expected to contain VOC concentrations greater than MCLs and the site-specific cleanup criteria in Table 5. Regular groundwater monitoring will be conducted to:

1. evaluate the VOC concentrations in groundwater
2. determine the groundwater flow direction
3. provide groundwater quality data for designing the ORC Advanced™ injections
4. confirm there is no migration of affected groundwater past the south and west sides of the DOT Building
5. determine when groundwater meets MCLs or the site-specific criteria

The groundwater sampling program will consist of the following:

- biannual samples from five upgradient monitoring wells in or near M Street (MW-14, DOT-MW1, DOT-MW2S, DOT-MW2D, and DOT-MW3).
- biannual samples from four downgradient monitoring wells (BE-SB/MW-04, F1-SB/MW01, DOT-MW4, and MW-21) until cleanup goals are achieved, and annual samples from the four downgradient monitoring wells thereafter.

Groundwater samples have been collected from each of the downgradient monitoring wells at least four times since January 2002 (Table 4). The BTEX concentrations in groundwater samples from the downgradient wells have always been less than MCLs. Based on the estimated hydraulic conductivity of the upper water-bearing zone (1.3 to 1.5 x 10^{-2} centimeters per second), rapid changes in groundwater quality are not expected to occur in the downgradient wells. Therefore biannual sampling of the downgradient monitoring wells is appropriate.

Groundwater monitoring will begin two months after the end of construction dewatering, or as soon thereafter as EPA has approved this plan. Before any groundwater samples are collected, the depth to water will be measured in all wells in the groundwater monitoring program. After the water levels have been measured, groundwater samples will be collected in accordance with the low-flow sampling standard operating procedure (SOP) in Appendix B of the IM Work Plan. Measurements of temperature, pH, conductivity, dissolved oxygen, turbidity, and redox potential will be continuously monitored during the well purging process. *In-situ* parameters will be allowed

to stabilize before sample collection begins. The field DO data will indicate whether DO concentrations in upgradient groundwater are sufficient to support biodegradation of BTEX, as described in Section 2.

Samples will be collected, handled, preserved, and transported in accordance with the SOPs in the Data Collection Quality Assurance Plan. The samples will be placed in pre-preserved sample containers. The samples will be placed in a cooler with ice and delivered to the laboratory with the appropriate chain-of-custody documentation. All samples will be analyzed for BTEX, MTBE and naphthalene using EPA Method 8260B. The sampling and analysis program is summarized in Table 6.

Purge water generated by sampling activities will be collected and placed in drums for characterization and disposal.

Groundwater monitoring will be discontinued when the groundwater samples collected from wells DOT-MW1, DOT-MW2S, DOT-MW2D, and DOT-MW3 contain VOC concentrations lower than the MCLs in Table 5 (or less than the site-specific cleanup criteria if it is technically impractical to achieve MCLs) during six consecutive sampling events spread over three years. The first of the six sampling events will occur at least 6 months after the last injection of ORC®.

3.1 Monitoring Well Abandonment

The sampling described in Table 6 will continue until the VOC concentrations in the samples are less than MCLs or the site-specific criteria during six consecutive sampling events. EPA will be notified that the groundwater meets the cleanup goals. After EPA concurrence that the monitoring program can be discontinued, the monitoring wells in the program will be abandoned as follows:

1. excavate around the well surface
2. pull as much of the well casing as possible
3. tremie with bentonite grout to a depth of at least 10 feet below grade
4. fill in surface hole
5. restore ground surface with cold material to match surrounding surface

3.2 Monitoring Well Placement and Replacement

This section describes the procedures that will be used if it becomes necessary to replace a monitoring well in the long term program, or if it becomes necessary to install an additional well to determine the direction of groundwater flow.

The boreholes for the monitoring well will be drilled using 4.25-inch inside diameter (ID) hollow-stem auger drilling methods. The soils recovered during drilling will be screened for organic vapors in the field using a photoionization detector and described in a field logbook.

The monitoring wells will be constructed of 2-inch ID threaded, flush jointed, schedule 40 polyvinyl chloride (PVC). The screens in all wells will be constructed of 10-foot-long PVC with 0.010-inch horizontal slots. Any replacement monitoring well will be screened at the same interval as the original well. A clean 6/20 sand filter pack will be placed from the bottom of the well borehole to approximately 2 feet above the top of the screen. A 3-foot-thick bentonite seal will then be placed on top of the sand filter pack. The remaining annular space will be backfilled with a cement-bentonite grout mixture (tremie piped from the bottom to the top). Well construction information will be recorded in a field notebook and as-built diagrams prepared for each monitoring well installed. It is anticipated that the monitoring wells will be finished with flush mount access holes; however, the surface completions of the wells will depend on the final use of the well. Each flush mount assembly will be 8 inches in length and have a lockable watertight cap. This assembly will be set in a hole that is at least 4 to 8 inches larger than the flush mount assembly and set in concrete.

Drill cuttings and water generated during well installation will be managed in accordance with federal and state guidelines. Investigation-derived wastes (IDW) will be characterized for offsite disposal after completing the field activities. A minimum of one sample will be collected per IDW matrix. Analytical parameters are listed in Table 6 (water) or Table 7 (soil).

All drilling activities will be conducted with clean equipment. All equipment will be decontaminated using a portable steam cleaner in accordance with the SOPs presented in Appendix C of the IM Work Plan. All decontamination fluids generated during the drilling activities will be contained in 55-gallon steel drums and managed in the same manner as the drill cuttings and water generated during the well installation.

Monitoring wells will be developed to remove sediments and ensure effective communication between the well screens and surrounding saturated zones. In addition, any wells

on the DOT Parcel that are found to have accumulated more than 1 foot of sediment will be re-developed. The wells will be developed by surging the screened interval to loosen any fine-grained sediment in the sand filter pack and adjacent aquifer material. Groundwater from the well will then be removed by bailing or pumping. Development will continue until the discharge has a turbidity of less than 100 nephelometric turbidity units (NTU). In addition, if water is added to the well borehole during the drilling and installation activities for the new monitoring wells, an equal or greater volume of water will be removed during well development. Water generated during the well development will be managed in the same manner as the IDW generated by the well drilling activities.

All development/redevelopment activities will be conducted with clean equipment to prevent potential cross-contamination between well locations. Equipment will be cleaned between each well using the decontamination procedure described in Appendix C of the IM Work Plan.

The elevations of the ground surface at each new monitoring well and the top of the PVC well casing will be surveyed to the nearest 0.01 foot by a D.C.-registered surveyor. The horizontal locations of the new wells will also be determined to the nearest 0.1 foot.

4.0 Permits and Approvals

The injection of ORC Advanced™ into the subsurface will require regulatory authorization. EPA Region 3 is the permitting authority for the underground injection control program in the District of Columbia. According to Mr. Mark Nelson, hydrologist in EPA Region 3, EPA regulates construction and operation of aquifer remediation related injection well(s) under "rule authorization." The material in Appendix C was submitted to EPA before the injection of ORC® during the IMs.

Because ORC Advanced™ is a different material than the ORC® permitted under the previous authorization, a separate application will be submitted for the ORC Advanced™ injection. The application will be submitted to EPA Region 3 Office of RCRA Programs for review and approval under rule authorization before the next injection of ORC Advanced™.

5.0 Health and Safety

The groundwater treatment and monitoring activities will be conducted in accordance with the Health and Safety Plan (HASP) in Appendix F of the IM Work Plan. The health and safety responsibilities for field activities are also described in Section 7.0. Contractors conducting injection of ORC Advanced™ or conducting other activities will be responsible for preparing HASPs for their activities and for ensuring compliance with 1910.120. A material safety data sheet for the ORC Advanced™ material is provided in Appendix B.

6.0 Data Analysis and Reporting Requirements

6.1 Analytical Subcontractor

The samples collected during the long-term groundwater monitoring program will be analyzed by Phase Separation Science (PSS) of Baltimore MD. PSS holds Certification #179 from the State of Maryland Water Quality Laboratory. PSS is discussed in more detail in the Data Collection Quality Assurance Plan (DCQAP), Appendix A of the IM Work Plan. An alternate laboratory may be used with prior approval from EPA.

6.2 Data Quality Objectives

6.2.1 Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements developed by data users to specify the quality of data needed from a particular data collection activity to support specific decisions or regulatory actions. The seven-step process for developing DQOs, as described by EPA guidance (EPA August 2000), is based on the following:

- state the problem
- identify the decision
- identify the inputs to the decision
- define the boundaries of the study
- develop a decision rule
- specify tolerable limits on decision errors.
- optimize the design for obtaining data

The project objectives are described in Section 1.0 of this Long Term Groundwater Treatment and Monitoring Plan. The data required and the data collection methods are described in Section 3.0. The third stage of the process is the basis for preparing the DCQAP and includes appropriate field techniques; appropriate analytical methods; and measurement objectives for selecting quantitation limits, project decision rules, representativeness, completeness, and comparability. These parameters are discussed in Section 6.4.

6.2.2 Specific Project Objectives

All laboratory analyses will be performed using approved EPA methods to include all quality assurance/ quality control (QA/QC) requirements. Additionally, 100 percent of the data, including all raw data, log sheets, and chromatograms will be validated to ensure reliable data that are compliant with applicable legal requirements. Further discussion of laboratory QA/QC and validation is found in Section 6.4. All field analyses will be performed using manufacturer-approved methods and EPA QA/QC requirements. Any field monitoring needed will be performed using instruments that have been calibrated at the beginning of each sampling day. Calibration information will be documented in accordance with the SOPs in Appendix B of the IM Work Plan.

6.3 Analytical Procedures

Field measurements will be obtained in accordance with the manufacturer's standard operating procedures for the respective instrument.

PSS will provide all analytical services using approved EPA preparation and analytical methods. Sample analysis will be pursuant to published EPA methods.

6.3.1 Analytical Procedures

All analytical procedures utilized for the long term program samples will be in accordance with EPA SW-846 methods or other EPA-approved methods. The analytical parameters and methods to be used are shown in Table 6 and Table 7.

6.3.2 Sample Preparation Methods

All sample preparation procedures utilized for long term program samples are shown in Table 6 and Table 7. All extraction and preparation methods will be in accordance with current EPA SW-846 methods or other EPA-approved methods.

6.3.3 Analytical Methods

The analytical methods to be utilized for samples collected during the long term program are shown in Table 6 and Table 7. All analytical methods will be in accordance with EPA SW-846 methods or other EPA-approved methods.

6.3.4 Confirmatory Analysis Methods

All confirmatory analysis methods utilized for samples collected during the long term program will be in accordance with current EPA SW-846 methods or other EPA-approved methods.

6.3.5 Summary Tables

Summary tables of results shall be included in all laboratory reports. In order to reduce the incidence of transcription errors, all tables will be created from electronic data deliverables (EDDs) supplied by the laboratory. The EDD format is described in the DCQAP.

6.3.6 QC Samples

QC samples that will be collected during onsite investigations include:

- Trip blanks: Laboratory provided blanks that will accompany VOC sample containers from Laboratory to site and back to laboratory. Each VOC shipment will contain at least one trip blank.
- Sample replicates: For every 20 samples collected of each matrix, one replicate sample will be collected (5 percent).
- Equipment/Rinsate blank: One equipment/rinsate blank will be collected per matrix type, once per day, or once per 20 samples, whichever is more frequent.
- Matrix spike samples: Matrix spikes will be prepared by the laboratory. Three times the normal sample aliquot will be collected for no fewer than one sample per 20 of the same matrix.

All quality control samples will be collected, analyzed, and evaluated as outlined in the DCQAP.

6.4 Quality Assurance Objectives for Measurement Data

The overall QA objective for this project is to develop and implement procedures for field sampling, chain of custody, laboratory analysis, and reporting that will provide results that are scientifically valid and legally compliant. Specific procedures for sampling, chain of custody, laboratory instrument calibration, laboratory analysis, data reporting, internal quality control, audits, preventive maintenance of field equipment, and corrective action are described in the DCQAP. All samples will be analyzed by EPA approved methods, and detection limits will

be based on the target detection limits in SW-846. The cleanup goals for the long-term groundwater treatment program will be MCLs or the site-specific groundwater criteria in Table 5. For each analyte and matrix, the laboratory reporting limits, are expected to be a minimum of one-half of the EPA Region III risk-based concentration (RBC) value.

6.4.1 Completeness

6.4.1.1 Definition

Completeness is a measure of the number of valid measurements obtained from a measurement system compared to the number that was expected to be obtained under normal conditions.

6.4.1.2 Field Completeness Objectives

Field completeness is a measure of the number of valid field measurements obtained from all the field measurements taken in the project. The equation for completeness is presented below. Field completeness for this project will be greater than 90 percent.

$$\% \text{ completeness} = \frac{\text{number of acceptable measurements}}{\text{total number of measurements}}$$

6.4.1.3 Laboratory Completeness Objectives

Laboratory completeness is a measure of the number of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented above. Laboratory completeness for this project will be greater than 95 percent.

6.4.2 Decision Rule

6.4.2.1 Definition

As defined in Step 5 of the EPA data quality objective guidance, the decision rule describes the manner in which project drivers, such as sample sets, sample representativeness, and guidance, will be chosen and carried out.

6.4.2.2 Statistical Parameters

Statistical parameters pertain to the manner in which the amount of samples (population), the type of samples (i.e. composite, discreet, grab), and sample dispersion are chosen. All sampling programs will be designed using sampling guidelines from EPA SW-846.

6.4.2.3 Cleanup Goals

The cleanup goals for the long-term groundwater treatment program will be the MCLs or the site-specific groundwater criteria in Table 5. For each analyte and matrix, the laboratory reporting limits are expected to be a minimum of one-half of the EPA Region III RBC value.

6.4.3 Representativeness

6.4.3.1 Definition

Representativeness expresses the degree to which data accurately and precisely represent characteristics of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

6.4.3.2 Measures to Ensure Representativeness of Field Data

All proposed field testing and measurement procedures are designed to maximize the goal that the field data will represent the conditions found at the site. All sampling efforts will be conducted using procedures designed to maximize the goal that the sample be representative of the matrix from which it was taken.

The use of trowels, hand augers, direct-push subsurface coring, and split-barrel auger driven subsurface borings will allow for the collection of soil samples from discrete depth intervals. Procedures for purging groundwater and the use of a screened well point, bottom-filling bailer, or other low-flow purging method will allow for collection of representative groundwater samples. These procedures will also prevent cross contamination between different sampling depths. Representative sampling of soils is addressed in the DCQAP.

6.4.3.3 Measures to Ensure Representativeness of Laboratory Data

All analytical methods are designed to produce data representative of the samples submitted for analysis. The proper execution of sample collection activities and performance audits will ensure data representativeness.

6.4.4 Comparability

6.4.4.1 Definition

Data comparability expresses the confidence with which one data set can be compared to another. All data collection mechanisms are designed to produce comparable data.

6.4.4.2 Measures to Ensure Comparability of Field Data

Procedures for field measurements are provided in Appendix B of the IM Work Plan to ensure that tests performed at various locations across the site are conducted using accepted procedures, in a consistent manner between locations and over time, and include appropriate QA/QC procedures (i.e., instrument calibration) to ensure the validity of the data. Any limitations on the comparability of test data will be noted and test results will be evaluated on that basis.

Sampling procedures for environmental matrices are provided in the DCQAP to ensure that samples are collected using accepted field techniques and in a consistent manner between locations and over time.

6.4.4.3 Measures to Ensure Comparability of Laboratory Data

All environmental media will be analyzed by the laboratory using consistent protocols for holding times, sample preparation, analytical methods, and QC as described in the approved EPA analytical procedures. SOP 2 in Appendix B of the IM Work Plan presents method, matrix, holding time, container, and preservation requirements.

The data will be reduced, reported, and documented consistently throughout the study. For example, onsite fill material and soil quality data will be reported using a consistent set of units throughout the study. Any deviations from established protocols will be noted in the database so that data comparability can be maintained.

6.4.5 Level of Quality Control Effort

The DCQAP addresses evidentiary considerations by defining how the acquisition and handling of samples and the reporting and review of data will be documented. Examples of the documentation include field notebook records, chain-of-custody forms (“CLP-LIKE” formats for data reporting), and the requirements for a "sign off" by the laboratory manager and QA reviewer of the data packages. Data packages include, but are not limited to, sample preparation logs, instrument run logs, and chromatograms. These forms of documentation could be used, if necessary, to support the integrity of the data generated.

Chemical analyses for samples collected during IM activities will be performed using SW-846 and other EPA-approved methods and protocols. The types of samples that will be collected and analytical parameters are shown in Table 6 and Table 7. Precision and accuracy

requirements will be as specified in the analytical method. The required detection limits for the parameters to be analyzed will be in accordance with the latest revision of SW-846.

For purposes of investigation QC, a minimum of 5 percent of all samples collected in the field for laboratory analyses will be replicated (i.e., there will be 1 blind duplicate sample for every 20 samples collected for each matrix). All duplicates will be submitted to the laboratory and analyzed for the same parameters as the associated sample. Replicate samples will not be collected for waste characterization sampling. Internal laboratory replicates will be analyzed at the rate of 1 for every 20 samples analyzed.

QC checks, such as equipment rinsate blanks, will be collected at a rate of one per sampling technique per sampling event. Equipment blanks will provide information regarding field contamination problems.

Matrix spike and matrix spike duplicate samples will be prepared and analyzed by the laboratory at the rate of no fewer than 1 per 20 samples of the same matrix. Sample matrices will thus be examined to evaluate their effects on the analytical protocols. When the collection of matrix spike/matrix spike duplicate (MS/MSD) samples is required, three times the normal sample aliquot will be collected at the designated location.

Laboratory blanks will be analyzed with each run to detect sample preparation, reagent, or system contamination. Upon initiation of an analytical run, the laboratory must perform calibration procedures as instructed by the analytical method(s) used and, where applicable, according to instrument manufacturer specifications. During the length of the run, continuing calibrations must be performed at the frequency specified. Where applicable, calibration blanks must be included in the calibration procedure.

At a minimum, precision will be estimated by calculating the relative percent difference (RPD) between MS and MSD samples and the RPD between duplicate samples. Statistical evaluation, in lieu of the RPD above, is encouraged if the number of samples per matrix is sufficient to obtain a quantity of field duplicates and MS/MSD samples above the minimal requirements.

Sample chain of custody will be maintained and documented as outlined in the DCQAP. Copies of the chain-of-custody sheets will be submitted to the EPA with the IM Completion Report.

Data, documentation, reports, and other project records will be maintained for 7 years after the termination of the Section 3013 Consent Order, as required by Section XI of the Consent Order. After the 7-year period, GSA-NCR will notify EPA in writing 120 days prior to the destruction of any such documents.

The control limits used, as outlined in the analytical method, must be maintained. Additional quality control limits or measures specified in the analytical methods used must also be maintained.

Laboratory QC reference samples will be integrated into the analytical scheme to assess accuracy. All field and laboratory QC samples will be analyzed using the same method protocols as regular samples, including all spikes, dilutions, and processing. All QC samples will be evaluated based on the Contract Laboratory Program (CLP) National Functional Guidelines for Organic and Inorganic Data Review, or method criteria specified in the associated EPA-approved methods.

7.0 Project Organization and Responsibility

GSA-NCR will have the overall responsibility for implementing the treatment and monitoring activities described in this plan. GSA-NCR will select a consultant, approved by EPA, to be responsible for performing the long-term treatment and monitoring activities, including field operations, subcontractor selection, data management, and data evaluation and reporting. PSS (or another EPA-approved laboratory selected by GSA-NCR) will conduct the laboratory analysis.

Because the activities at SEFC will occur over an extended period, the companies and personnel conducting the work may change. In the event of a change, GSA-NCR will submit a letter to EPA notifying them of the change, providing the necessary qualifications, and requesting approval of the change.

7.1 Management Responsibilities

7.1.1 GSA-NCR

GSA-NCR has the overall responsibility for all phases of the CO activities, including the long term groundwater treatment and sampling activities. GSA-NCR will manage the coordination and implementation of the long-term treatment and monitoring activities, provide senior technical and resource management support, and routinely evaluate program performance.

7.1.2 JBG/Federal Center, L.L.C.

GSA-NCR will transfer the DOT Parcel to JBG/Federal Center, L.L.C.. As the owner of the DOT Parcel, JBG/Federal Center, L.L.C. will grant access to the property for the purpose of treatment and monitoring. Neither JBG/Federal Center L.L.C. nor any subsequent owner will be responsible for conducting any of the long-term groundwater treatment and monitoring activities.

7.1.3 Consultant

A consultant selected by GSA-NCR will perform the long-term treatment and monitoring activities. The selected consultant shall designate a project director, project manager, project engineer and field team leader for the long-term treatment and monitoring. The project director will be responsible for ensuring that the long-term treatment and monitoring is performed in strict compliance with the approved Work Plan, and will have the authority to commit the firm's resources to accomplish the project objectives. The project director will have ultimate

responsibility for contractor and subcontractor performance and, with the project manager, will form the management team for the project.

The selected consultant shall designate a project manager and an engineer of record for the long-term treatment and monitoring program. The project manager shall be a licensed professional engineer in the District of Columbia. The project manager will be responsible for the direction and management of all field, laboratory, and office activities associated with the long-term treatment and monitoring. The project manager shall have the responsibility and authority to procure the necessary support services. The project manager will also be responsible for staffing, scheduling, and reporting all project activities to GSA-NCR, JBG/Federal Center, L.L.C., and EPA, and will report directly to the project director.

7.2 Quality Assurance Responsibilities

In-house quality assurance will be provided by the laboratory's project manager and Quality Assurance Officer (QAO) before release of all data. The selected consultant shall designate a QAO who will be responsible for all QA/QC aspects of the work.

The consultant QAO will be responsible for meeting QA goals during investigations and will serve as overall QAO for all sampling and analyses. The consultant QAO will be responsible for ensuring that all contractors designate a project QAO where relevant and that each contractor complies fully with all aspects during each phase of the effort. In particular, the consultant QAO will work closely with the analytical laboratory QAO to ensure that all QA/QC requirements are being met. The consultant QAO's responsibilities include, but are not limited to the following:

- field operations QC
- sampling QC
- laboratory QC
- data processing QC
- data quality review
- performance auditing
- systems auditing
- overall QA

The QA/QC activities and the designated consultant QC representative(s) are given below:

Overall QA/QC	project manager and QAO
Sampling Operations and Sampling QC	project manager and QAO
Laboratory Analyses and Laboratory QC	QAO
Data Review	project manager and QAO
Performance and System Audits	QAO
Laboratory Audit	QAO

7.3 Laboratory Responsibilities

PSS of Baltimore, Maryland, will conduct laboratory analysis for the long-term groundwater monitoring activities. An alternate laboratory may be used with prior approval from EPA. The selected laboratory will provide the chemical testing services on all samples collected. PSS will be responsible for conducting all chemical testing in accordance with its Quality Assurance Plan (QAP), which is included in the DCQAP in Appendix A of the IM Work Plan. If an alternate laboratory is selected, the laboratory must submit its QAP to GSA-NCR and EPA for approval, and will be responsible for conducting all chemical testing in accordance with its QAP. The selected laboratory will designate a project manager and QAO.

7.3.1 Project Manager

The laboratory project manager will serve as the laboratory representative for day-to-day contacts. The project manager will be responsible for ensuring that the resources of the laboratory will be available on an as-required basis. The laboratory project manager will report directly to the Contractor QAO (or designee) to facilitate coordination of all planned sampling and chemical testing activities. The laboratory project manager will also oversee the preparation of final analytical reports.

7.3.2 Operations Manager

The laboratory operations manager will report to the laboratory project manager and will be responsible for: coordinating laboratory analyses; supervising in-house chain-of-custody; scheduling sample analyses; overseeing data review; overseeing preparation of analytical reports; and approving final analytical reports.

7.3.3 Quality Assurance Officer

The laboratory QAO is responsible for ensuring that all testing is conducted in accordance with the laboratory QA Plan. The laboratory QAO will report directly to the Contractor QAO when corrective action is required as a result of compliance and performance audits.

7.3.4 Sample Custodian

The laboratory sample custodian will report to the laboratory operations manager. The sample custodian will be responsible for: receiving and inspecting the incoming sample containers; recording the condition of the incoming sample containers; signing appropriate documents; verifying chain-of-custody and its correctness; notifying the laboratory operations manager of sample receipt and inspection; assigning a unique identification number and customer number, and entering each into the sample receiving log; initiating transfer of samples to the appropriate laboratory sections; and controlling and monitoring access/storage of samples and extracts.

7.4 Field Responsibilities

7.4.1 Field Team Leader

The selected consultant shall designate a field team leader, who will be responsible for leading and coordinating the day-to-day activities of the various resource specialists under her supervision. The individual assigned as the field team leader may change throughout the completion of unit specific projects. The designated field team leader shall be an experienced environmental professional and will report directly to the project manager. Specific field team leader responsibilities include:

- providing day-to-day coordination with the project manager on technical issues in specific areas of expertise
- developing and implementing field-related Work Plans, assuring schedule compliance, and adhering to the Work Plans
- coordinating and managing field staff including sampling and field laboratory staff
- conducting QC of technical data provided by the field staff including field measurement data

- adhering to work schedules provided by the project manager
- authoring, writing, and approving of text and graphics required for field team efforts
- coordinating and overseeing technical efforts of subcontractors assisting the field team
- identifying problems at the field team level, resolving difficulties in consultation with the project manager, implementing and documenting corrective action procedures, and communicating between team and upper management
- participating in preparation of the final report

7.4.2 Field Technical Staff

The technical staff (team members) for this project will be drawn from the resources of the selected consultant. The technical team staff will be utilized to gather and analyze data, and to prepare various task reports and support materials. All of the designated technical team members will be experienced professionals who possess the degree of specialization and technical competence required to perform, effectively and efficiently, the required work. The technical staff will be required to read the HASP in Appendix E of the IM Work Plan (or other approved site-specific HASP), and sign the certification in the HASP.

7.4.3 Health and Safety Officer

The selected consultant shall designate a site-specific health and safety officer for long-term treatment and monitoring activities. The designated field team leader may serve as the site-specific health and safety officer. The site-specific health and safety officer will be responsible for the following:

- ensuring that all site activities are performed in accordance with the HASP
- ensuring that all site activities are performed in a safe manner to eliminate danger to personnel performing the field activities
- providing guidance to the injured for immediate medical attention
- filing personnel injury reports to the project manager

The designated GSA-NCR Health and Safety Officer is also responsible for ensuring that all field activities are conducted in accordance with the HASP. Any subcontractors conducting

work on the site shall designate a Health and Safety Officer responsible for ensuring that contractor employees conduct field activities in accordance with the HASP.

8.0 Reporting

The long-term groundwater treatment and monitoring activities will be included in the SEFC quarterly CO progress reports. The following information on the long-term program will be included in the quarterly progress reports:

- the treatment activities conducted
- the monitoring activities conducted
- data summary tables for samples collected during the reporting period including sample locations, dates, identifications and complete analytical results with laboratory and data validation qualifiers
- evaluation of groundwater flow direction
- evaluation of groundwater BTEX concentrations and relation to cleanup goals
- summaries of problems or potential problems encountered
- actions taken to rectify problems
- changes in personnel
- projected work for the next reporting period
- copies of laboratory and monitoring data for samples collected during the reporting period, including groundwater elevation data

9.0 Schedule

The long-term groundwater monitoring will be conducted biannually. The start of the groundwater treatment and monitoring program is contingent on the DOT building construction schedule. Groundwater monitoring will begin 2 months after the end of construction dewatering, provided that GSA-NCR has received EPA approval of this Long Term Plan by that time. The first injection of ORC Advanced™ will occur approximately 6 months after the end of construction dewatering, or when groundwater contains less than 1 mg/l DO. ORC Advanced™ injection will be conducted in accordance with Section 2.2.

Treatment and monitoring will continue until the VOC concentrations in samples from the four upgradient monitoring wells are less than MCLs or EPA-approved site-specific cleanup criteria for six consecutive sampling events spread over three years. The first of the six sampling events must occur at least 6 months after the last injection of ORC Advanced™.

10.0 References

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Figures

Tables

Table 1
Groundwater Sampling Results - HMW-14
DOT Parcel at Southeast Federal Center
Washington, DC (a)

Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	TPH
Feb-95	560	150	43	210	NA	3500
May-95	170	20	130	150	NA	4200
Aug-95	2600	1100	130	1000	NA	12000
Nov-95	NS	NS	NS	NS	NS	NS
Feb-96	910	60	80	500	NA	5500
May-96	790	15	17	79	NA	3900
Aug-96	1700	400	40	1600	NA	9600
Dec-96	1000	180	90	660	NA	1930
Mar-97	886	36	56	507	NA	5250
Jun-97	7160	790	310	9970	NA	45800
Sep-97	5930	1080	762	5760	NA	64200
Dec-97	5240	340	1320	2870	NA	27400
Mar-98	1880	98	308	989	61	ND
Jun-98	2670	168	182	1260	NA	9710
Sep-98	1640	44	142	550	ND	5900
Dec-98	3910	189	712	2260	33	23600
Feb-99	6700	292	1520	2830	ND	34500
Aug-99	2560	77	703	1120	38	16000
Mar-00	1370	382	363	708	30	9280
Sep-00	3740	1010	880	3660	13	29700
Jun-01	4690	1620	1520	5480	13	39000
Sep-01	4750	812	1370	5620	ND	35100
Mar-02	3580	230	1380	2010	BDL(100)	23800
Jun-02	3770	250	1770	3750	BDL(50)	37100
Sep-02	5100	179	1610	2790	BDL(100)	28900
Mar-03	5700	300	2200	4300	BDL(100)	59000
Jun-03	6700	910	4600	9500	BDL(50)	79000
Sep-03	5600	290	5100	6800	BDL(5.0)	70000
Apr-04	5800	920	3300	8700	BDL(5.0)	56000
Jun-04	7200	580	3800	5610	BDL(100)	NA
Jul-04	3300	320	1400	3000	NA	NA
Sep-04	4700	480	2400	3200	BDL(100)	NA
Dec-04	4900	590	2600	5620	BDL(10)	NA
Mar-05	1200	57	680	818	BDL(10)	NA
Jun-05	2100	140	570	1369	BDL(10)	NA

NA = Not Analyzed NS = Not Sampled
ND = Not Detected BDL(x) - Below Detection Limit (x=detection limit)

a/ All concentrations in micrograms per liter.
All samples collected by purging three well volumes and collecting the sample with a disposable bailer.

Table 2

Groundwater Sampling Results - MW03
Southeast Federal Center
Washington, DC (a)

Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	TPH	Sampled By (b)
Jan-91	2000	440	630	580	NA	NA	K&D
Jan-96	79	7.9	24	22.1	NA	325	Woodward-Clyde
May-96	580	750	260	760	NA	11000	Handex
Aug-96	1300	1900	450	1600	NA	18000	Handex
Dec-96	3400	6900	100	4000	NA	33000	Handex
Mar-97	1970	3680	722	2350	NA	28700	Handex
Jun-97	1230	1680	303	945	NA	11000	Handex
Sep-97	1160	1140	317	856	ND	11000	Handex
Dec-97	703	796	209	632	NA	5410	Handex
Mar-98	979	2330	368	1660	ND	8590	Handex
Jun-98	2040	4820	1040	4020	NA	23200	Handex
Sep-98	750	890	259	690	ND	5770	Handex
Dec-98	1220	2420	551	1390	ND	17600	Handex
Feb-99	900	1490	470	1120	ND	14200	Handex
Aug-99	780	290	185	277	ND	5080	Handex
Mar-00	1400	342	830	520	2	8520	Handex
Jun-01	1360	2680	1230	3140	87	1900	Handex
Sep-01	535	837	455	912	ND	18000	Handex
Jan-02	240	16	111	145	<2	NA	URS
Mar-02	731	33	306	276	<2	NA	URS
Mar-02	234	10.9	87.1	58.3	<1	2600	Handex
Jun-02	1410	88.1	452	288	<50	9100	Handex
Jul-02	1600	113	534	444	<2	NA	URS
Sep-02	1310	121	437	363	<50	8000	Handex
Mar-03	1500	92	450	440	<5	21000	Handex
Jun-03	450	410	350	790	36	7400	Handex
Sep-03	300	430	370	920	37	6900	Handex
Nov-03	2200	850	870	1130	<1	NA	Environ. Strategies
Jan-04	Monitoring well MW-03 abandoned						

NA = Not Analyzed
ND = Not Detected. Detection Limit not provided.
a/ All concentrations in micrograms per liter
b/ Handex data from District of Columbia files for Former Shell Retail Facility, 212 M Street, LUST Case 93-085

Table 3

Summary of In-Situ Water Sample Analytical Results
Delineation Investigation
DOT Parcel at Southeast Federal Center
Washington D.C. (a)

Sample Location:	GP-01				GP-2		GP-03			GP-04		
Sample Date:	11/13/2003				11/11/03		11/11/03			11/06/03		
Depth (ft-bgs):	18-20	23-25	28-30	33-35	28-30	33-35	28-30	33-35	38-40	28-30	33-35	38-40
VOCs (ug/l)												
Methyl-t-Butyl Ether	1 U	9	5	5	2	5	10 U	20 U	20 U	10	2	1 U
Benzene	1 U	1 U	230 E	74	170	1,700	550	5,000 E	5,100 E	22	6,800 E	1,700
Toluene	1 U	1 U	3	1	3	12	16	66	69	1 U	180	21
Ethylbenzene	1 U	1 U	1 U	U	2	41	29	570	540	1 U	1,200	220
m&p-Xylene	15 U	15 U	10 J	2 J	3 J	9 J	54 J	76 J	81 J	15 U	1,100	20
o-Xylene	15 U	15 U	3 J	U	3 J	13 J	14 J	270 J	280 J	15 U	360	54
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	100 U	200 U	200 U	10 U	100 U	100 U
2-Butanone (MEK)	50 U	50 U	50 U	50 U	50 U	50 U	500 U	1000 U	1000 U	50 U	500 U	500 U
Methylisobutylketone (MIBK)	10 U	10 U	10 U	10 U	10 U	10 U	100 U	200 U	200 U	10 U	100 U	100 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	100 U	200 U	200 U	10 U	100 U	100 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	100 U	200 U	200 U	10 U	100 U	100 U

a/ U= under quantitation limit; J, E = estimated concentration
b/ Duplicate sample

Table 3

Summary of In-Situ Water Sample Analytical Results
Delineation Investigation
DOT Parcel at Southeast Federal Center
Washington D.C. (a)

Sample Location:	GP-05					GP-06						GP-07			
Sample Date:	11/05/03					11/12/2003						11/6/2003			
Depth (ft-bgs):	18-20	28-30	33-35	38-40	38-40(b)	18-20	23-25	28-30	33-35	38-40	38-40(b)	23-25	28-30	33-35	35-37
VOCs (ug/l)															
Methyl-t-Butyl Ether	20 U	6	20 U	4	4	100 U	100 U	44	32	58	61	100 U	3	3	6
Benzene	48	1,100	930	4	4	5,800	14,000	220	410	35	35	12,000	3,600	3,100	64
Toluene	30	9	68	7	7	3,400	4,200	160	360	48	47	8,400	330	220	51
Ethylbenzene	560	100	400	79	78	3,100	4,000	360	420	100	100	4,000	2,000	1,000	39
m&p-Xylene	1000	210	1,100	210	210	8,900	12,000	1,100	1,100	290	280	10,000	2,800	1,100	100
o-Xylene	60 J	73	300	55	55	3,000	3,800	390	420	87	87	4,000	230 J	440	40
Acetone	100 U	100 U	100 U	10 U	10 U	1000 U	1000 U	100 U	100 U	10 U	10 U	1000 U	1000 U	1000 U	100 U
2-Butanone (MEK)	500 U	500 U	500 U	50 U	50 U	5000 U	5000 U	500 U	500 U	50 U	50 U	5000 U	5000 U	5000 U	500 U
Methylisobutylketone (MIBK)	100 U	100 U	100 U	10 U	10 U	1000 U	1000 U	100 U	100 U	10 U	10 U	1000 U	1000 U	1000 U	100 U
1,3-Dichlorobenzene	100 U	100 U	100 U	10 U	10 U	1000 U	1000 U	100 U	100 U	10 U	10 U	1000 U	1000 U	1000 U	100 U
1,2,4-Trichlorobenzene	100 U	100 U	100 U	10 U	10 U	1000 U	1000 U	100 U	100 U	10 U	10 U	1000 U	1000 U	1000 U	100 U

a/ U= under quantitation limit; J, E
b/ Duplicate sample

Table 3

Summary of In-Situ Water Sample Analytical Results
Delineation Investigation
DOT Parcel at Southeast Federal Center
Washington D.C. (a)

Sample Location:	GP-08					GP-09			GP-10			
Sample Date:	11/6/2003					11/10/2003			11/10/2003			
Depth (ft-bgs):	18-20	23-25	28-30	33-35	38-40	18-20	23-25	28-30	18-20	23-25	28-30	33-35
VOCs (ug/l)												
Methyl-t-Butyl Ether	2	3	2	1 U	1 U	10 U	100 U	1 J	10 U	20 U	100 U	20 U
Benzene	4,600	6,800	3,800	2,000	1,700	3,600	3,000	890	3,300	9,900	14,000	6,900
Toluene	13,000	18,000	130	110	290	18,000	18,000	220	160	130	390	85
Ethylbenzene	1,600	2,400	1,100	750	1,200	3,500	3,900	420	1,800	1,600	1,400	23
m&p-Xylene	4,400	5,600	1,400	1,100	1,800	10,000	8,800	490	320	270 J	1,100 J	130 J
o-Xylene	2,400	3,000	140	820	1,200	5,300	4,700	360	120 J	66 J	250 J	60 J
Acetone	1000 U	1000 U	1000 U	100 U	100 U	100 U	1000 U	10 U	100 U	200 U	1000 U	200 U
2-Butanone (MEK)	5000 U	5000 U	5000 U	500 U	500 U	500 U	5000 U	50 U	500 U	1000 U	5000 U	1000 U
Methylisobutylketone (MIBK)	1000 U	1000 U	1000 U	100 U	100 U	100 U	1000 U	10 U	100 U	200 U	1000 U	200 U
1,3-Dichlorobenzene	1000 U	1000 U	1000 U	100 U	100 U	100 U	1000 U	10 U	100 U	200 U	1000 U	200 U
1,2,4-Trichlorobenzene	1000 U	1000 U	1000 U	100 U	100 U	100 U	1000 U	10 U	100 U	200 U	1000 U	200 U

a/ U= under quantitation limit; J, E
b/ Duplicate sample

Table 3

Summary of In-Situ Water Sample Analytical Results
Delineation Investigation
DOT Parcel at Southeast Federal Center
Washington D.C. (a)

Sample Location:	GP-12					GP-13		GP-14				
Sample Date:	11/18/2003					11/12/2003		11/13/2003				
Depth (ft-bgs):	18-20	23-25	28-30	33-35	38-40	18-20	22-24	18-20	23-25	28-30	33-35	38-40
VOCs (ug/l)												
Methyl-t-Butyl Ether	100 U	100 U	10 U	1 U	1 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U
Benzene	100	10,000	2,900 E	3,600	140	10 U	10 U	3	130	1 U	1 U	1 U
Toluene	960	35,000 E	6,500 E	6,600	1,300	10 U	10 U	1 U	1	1 U	1 U	1 U
Ethylbenzene	1,900	3,800	1,400	1,700	340	10 U	10 U	1 U	1	1 U	1 U	1 U
m&p-Xylene	3,900	12,000	2,700	3,500	850	12 J	10 J	1 J	8 J	15 U	15 U	15 U
o-Xylene	1,700	5,400	1,500	2,100	430	14 J	11 J	15 U	2 J	15 U	15 U	15 U
Acetone	1000 U	1000 U	1000 U	1000 U	1000 U	470	830	10 U	10 U	10 U	10 U	10 U
2-Butanone (MEK)	5000 U	5000 U	5000 U	5000 U	5000 U	99	170	50 U	50 U	50 U	50 U	50 U
Methylisobutylketone (MIBK)	1000 U	1000 U	1000 U	1000 U	1000 U	35	52	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	1000 U	1000 U	1000 U	1000 U	1000 U	30	21	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	1000 U	1000 U	1000 U	1000 U	1000 U	110	91	10 U	10 U	10 U	10 U	10 U

a/ U= under quantitation limit; J, E
b/ Duplicate sample

Table 3

Summary of In-Situ Water Sample Analytical Results
Delineation Investigation
DOT Parcel at Southeast Federal Center
Washington D.C. (a)

Sample Location:	GP-15					GP-16					GP-17			
Sample Date:	11/18/2003					11/13/2003					11/18/2003			
Depth (ft-bgs):	18-20	23-25	28-30	33-35	38-40	18-20	23-25	28-30	33-35	38-40	18-20	23-25	28-30	33-35
VOCs (ug/l)														
Methyl-t-Butyl Ether	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	1 U	1 U	1 U	1 U	1 U
Benzene	150	82	480	1 U	3	10	5	1 U	2,200	5	1 U	1 U	1 U	1 U
Toluene	10 U	2	8	1 U	3	1 U	1 U	1 U	41	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	17	11	6	1 U	2	1 U	1 U	1 U	980	2	1 U	1 U	1 U	1 U
m&p-Xylene	18 J	5 J	23	15 U	6 J	15 U	2 J	15 U	93 J	15 U	15 U	15 U	15 U	15 U
o-Xylene	10 J	1 J	9 J	15 U	3 J	15 U	15 U	15 U	23 J	15 U	15 U	15 U	15 U	15 U
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1000 U	10 U	10 U	10 U	10 U	10 U
2-Butanone (MEK)	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	5000 U	50 U	50 U	50 U	50 U	50 U
Methylisobutylketone (MIBK)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1000 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1000 U	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1000 U	10 U	10 U	10 U	10 U	10 U

a/ U= under quantitation limit; J, E
b/ Duplicate sample

Table 3

Summary of In-Situ Water Sample Analytical Results
Delineation Investigation
DOT Parcel at Southeast Federal Center
Washington D.C. (a)

Sample Location:	GP-18					GP-19					GP-20		
Sample Date:	11/14/2003					11/20/2003					11/20/2003		
Depth (ft-bgs):	18-20	23-25	28-30	33-35	38-40	23-25	23-25b	28-30	33-35	38-40	23-25	28-30	38-40
VOCs (ug/l)													
Methyl-t-Butyl Ether	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2	5	1 U
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
m&p-Xylene	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U
o-Xylene	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone (MEK)	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Methylisobutylketone (MIBK)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

a/ U= under quantitation limit; J, E
b/ Duplicate sample

Table 3

Summary of In-Situ Water Sample Analytical Results
Delineation Investigation
DOT Parcel at Southeast Federal Center
Washington D.C. (a)

Sample Location:	GP-A				GP-B				
Sample Date:	11/14/2003				11/17/2003				
Depth (ft-bgs):	23-25	28-30	33-35	38-40	18-20	18-20(b)	23-25	33-35	38-40
VOCs (ug/l)									
Methyl-t-Butyl Ether	100 U	4	2	1 U	1 U	1 U	2	1 U	1 U
Benzene	6,300	3,400	310 E	12	1 U	1 U	1 U	1 U	1 U
Toluene	210	65	4	2	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	3,500	800	8	14	1 U	1 U	1 U	1 U	1 U
m&p-Xylene	4,900	1,400	17	25	15 U	15 U	15 U	15 U	15 U
o-Xylene	230 J	91	4 J	7 J	15 U	15 U	15 U	15 U	15 U
Acetone	1000 U	1000 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone (MEK)	5000 U	5000 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Methylisobutylketone (MIBK)	1000 U	1000 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	1000 U	1000 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	1000 U	1000 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

a/ U= under quantitation limit; J, E
b/ Duplicate sample

Table 4

Groundwater Sampling Results for Wells in Long Term Monitoring Program
DOT Parcel at Southeast Federal Center
Washington D.C.

	Sample Location	BE-SB_MW04	BE-SB_MW04	BE-SB_MW04	BE-SB_MW04	BE-SB_MW06 [a]	BE-SB_MW06 [a]	BE-SB_MW06 [a]	BE-SB_MW06 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]
	Sample Date	2/1/02	4/1/02	7/8/02	11/12/03	1/31/02	4/1/02	7/8/02	11/12/03	1/31/02	1/31/02	4/1/02	7/9/02	7/9/02	11/12/03	6/23/04	9/16/04
	Sample Depth	25	25	14.75	14.75	25	25	14.75	14.75	25	25	25	15	15	15	15	15
CONSTITUENT	UNITS	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate 1	Primary	Primary	Duplicate 1	Primary	Primary	Primary
1,1,1,2-Tetrachloroethane	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
1,1,1-Trichloroethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
1,1,2,2-Tetrachloroethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
1,1,2-Trichloroethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
1,1-Dichloroethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
1,1-Dichloroethylene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
1,2,3-Trichloropropane	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
1,2,4-Trichlorobenzene	ug/l	NT	NT	NT	<1 U	NT	NT	NT	<1 U	NT	NT	NT	NT	NT	<1 U	<1 U	<1 U
1,2-Dichloroethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
1,2-Dichloropropane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
1,4-Dioxane	ug/l	<150 U	<150 U	<150 U	NT	<150 U	<150 U	<150 U	NT	<150 U	<150 U	<150 U	<150 U	<150 U	NT	NT	NT
2-Hexanone	ug/l	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Acetone	ug/l	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Acetonitrile	ug/l	<20 U	<20 U	<10 U	NT	<20 U	<20 U	<10 U	NT	<20 U	<20 U	<20 U	<10 U	<10 U	NT	NT	NT
Acrolein	ug/l	<20 U	<20 U	<20 U	NT	<20 U	<20 U	<20 U	NT	<20 U	<20 U	<20 U	<20 U	<20 U	NT	NT	NT
Acrylonitrile	ug/l	<20 U	<20 U	<20 U	NT	<20 U	<20 U	<20 U	NT	<20 U	<20 U	<20 U	<20 U	<20 U	NT	NT	NT
Allyl chloride	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
Benzene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Benzene, 1-methylethyl-	ug/l	NT	NT	NT	<1 U	NT	NT	NT	<1 U	NT	NT	NT	NT	NT	<1 U	<1 U	<1 U
Bromodichloromethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Bromoform	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Carbon disulfide	ug/l	<5 U	<5 U	<5 U	<10 U	<5 U	5.7	<5 U	<10 U	<5 U	<5 U	<5 U	<5 U	<5 U	<10 U	<10 U	<10 U
Carbon tetrachloride	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Chlorobenzene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Chloroethane	ug/l	<10 U	<10 U	<5 U	<1 U	<10 U	<10 U	<5 U	<1 U	<10 U	<10 U	<10 U	<5 U	<5 U	<1 U	<1 U	<1 U
Chloroform	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Chloroprene	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
cis-1,2-Dichloroethylene	ug/l	NT	NT	NT	<1 U	NT	NT	NT	<1 U	NT	NT	NT	NT	NT	<1 U	<1 U	<1 U
cis-1,3-Dichloropropene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U

Table 4

Groundwater Sampling Results for Wells in Long Term Monitoring Program
DOT Parcel at Southeast Federal Center
Washington D.C.

	Sample Location	BE-SB_MW04	BE-SB_MW04	BE-SB_MW04	BE-SB_MW04	BE-SB_MW06 [a]	BE-SB_MW06 [a]	BE-SB_MW06 [a]	BE-SB_MW06 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]	BE-SB_MW08 [a]
	Sample Date	2/1/02	4/1/02	7/8/02	11/12/03	1/31/02	4/1/02	7/8/02	11/12/03	1/31/02	1/31/02	4/1/02	7/9/02	7/9/02	11/12/03	6/23/04	9/16/04
	Sample Depth	25	25	14.75	14.75	25	25	14.75	14.75	25	25	25	15	15	15	15	15
CONSTITUENT	UNITS	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate 1	Primary	Primary	Duplicate 1	Primary	Primary	Primary
Cyclohexane	ug/l	NT	NT	NT	<1 U	NT	NT	NT	<1 U	NT	NT	NT	NT	NT	<1 U	<5 U	<5 U
DBCP	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Dibromochloromethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Dichlorodifluoromethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
EDB	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Ethene, 1,2-dichloro-, E-	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Ethyl cyanide	ug/l	<10 U	<10 U	<10 U	NT	<10 U	<10 U	<10 U	NT	<10 U	<10 U	<10 U	<10 U	<10 U	NT	NT	NT
Ethyl methacrylate	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
Ethylbenzene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Freon 113	ug/l	NT	NT	NT	<1 U	NT	NT	NT	<1 U	NT	NT	NT	NT	NT	<1 U	<1 U	<1 U
Isobutylalcohol	ug/l	<40 U	<40 U	<40 U	NT	<40 U	<40 U	<40 U	NT	<40 U	<40 U	<40 U	<40 U	<40 U	NT	NT	NT
m/p-xylene	ug/l	NT	NT	NT	<15 U	NT	NT	NT	1 J	NT	NT	NT	NT	NT	<15 U	<2 U	<2 U
m-Dichlorobenzene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Methacrylonitrile	ug/l	<10 U	<10 U	<10 U	NT	<10 U	<10 U	<10 U	NT	<10 U	<10 U	<10 U	<10 U	<10 U	NT	NT	NT
Methyl Acetate	ug/l	NT	NT	NT	<1 U	NT	NT	NT	<1 U	NT	NT	NT	NT	NT	<1 U	<1 U	<1 U
Methyl bromide	ug/l	<10 U	<10 U	<5 U	<1 U	<10 U	<10 U	<5 U	<1 U	<10 U	<10 U	<10 U	<5 U	<5 U	<1 U	<1 U	<1 U
Methyl chloride	ug/l	<10 U	<10 U	<5 U	<1 U	<10 U	<10 U	<5 U	<1 U	<10 U	<10 U	<10 U	<5 U	<5 U	<1 U	<1 U	<1 U
Methyl ethylketone	ug/l	<10 U	<10 U	<10 U	<50 U	<10 U	<10 U	<10 U	<50 U	<10 U	<10 U	<10 U	<10 U	<10 U	<50 U	<50 U	<50 U
Methyl iodide	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
Methyl isobutyl ketone MIBK	ug/l	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Methyl methacrylate	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
Methylcyclohexane	ug/l	NT	NT	NT	<1 U	NT	NT	NT	<1 U	NT	NT	NT	NT	NT	<1 U	<5 U	<5 U
Methylene bromide	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
Methylene chloride	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Methyltert-butylether	ug/l	20	13	5.8	1	<2 U	<2 U	<2 U	<1 U	<2 U	<2 U	<2 U	<2 U	<2 U	<1 U	<1 U	<1 U
Naphthalene	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<1 U	<1 U
o-Dichlorobenzene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
o-Xylene	ug/l	NT	NT	NT	<15 U	NT	NT	NT	<15 U	NT	NT	NT	NT	NT	<15 U	<1 U	<1 U
p-Dichlorobenzene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Styrene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Tetrachloroethylene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Toluene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
trans-1,3-Dichloropropene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
trans-1,4-Dichloro-2-butene	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
Trichloroethylene	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Trichlorofluoromethane	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U
Vinyl Acetate	ug/l	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	NT	<5 U	<5 U	<5 U	<5 U	<5 U	NT	NT	NT
Vinyl chloride	ug/l	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U	<1 U	<1 U	<1 U
Xylene total	ug/l	<5 U	<5 U	<15 U	NT	<5 U	<5 U	<15 U	NT	<5 U	<5 U	<5 U	<15 U	<15 U	NT	NT	NT

a/ Wells BE-SB/MW06 and BE-SB/MW08 are not in the monitoring program, but could be substituted for BE-SB/MW-04 if necessary.
B = Probable blank contamination
E = Estimated value
J = Estimated concentration
U = Analyzed for but not detected at the detection limit
NT = Not Tested

Table 4

Groundwater Sampling Results for Wells in Long Term Monitoring Program
DOT Parcel at Southeast Federal Center
Washington D.C.

	Sample Location	DOT-MW-1	DOT-MW-1	DOT-MW-1	DOT-MW-1	DOT-MW-2D	DOT-MW-2D	DOT-MW-2D	DOT-MW-2D	DOT-MW-2D	DOT-MW-2S	DOT-MW-3	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4	F1-SB_MW01
	Sample Date	4/22/04	6/23/04	12/20/04	3/24/2005	2/26/04	6/23/04	6/23/04	10/1/04	3/24/2005	2/26/04	2/26/04	2/26/04	6/23/04	9/17/04	12/20/04	3/24/2005	2/1/02
	Sample Depth	30	30	30	30	35	35	35	35	35	20	25	30	30	30	30	30	15
CONSTITUENT	UNITS	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate 1	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
1,1,1,2-Tetrachloroethane	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
1,1,1-Trichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
1,1,2,2-Tetrachloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
1,1,2-Trichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
1,1-Dichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
1,1-Dichloroethylene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
1,2,3-Trichloropropane	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
1,2,4-Trichlorobenzene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	NT
1,2-Dichloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
1,2-Dichloropropane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
1,4-Dioxane	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<150 U
2-Hexanone	ug/l	<10 U	<10 U	<10 U	<10 U	<1,000 U	19 J	20 J	<200 U	<200 U	<1,000 U	<1,000 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Acetone	ug/l	<10 U	<10 U	<10 U	<10 U	<1,000 U	<100 U	<100 U	<200 U	<200 U	<1,000 U	<1,000 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Acetonitrile	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<20 U
Acrolein	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<20 U
Acrylonitrile	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<20 U
Allyl chloride	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
Benzene	ug/l	<1 U	12	<1 U	5	9,600	16,000	15,000	7,200	6,200	32000 E	2,900	1	<1 U	<1 U	<1 U	<1 U	<5 U
Benzene, 1-methylethyl-	ug/l	<1 U	<1 U	<1 U	<1 U	110	51	50	<20 U	32	<100 U	100	<1 U	<1 U	<1 U	<1 U	<1 U	NT
Bromodichloromethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Bromoform	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Carbon disulfide	ug/l	<10 U	<10 U	<10 U	<10 U	<1,000 U	<100 U	<100 U	<200 U	<200 U	<1,000 U	<1,000 U	<10 U	<10 U	<10 U	<10 U	<10 U	<5 U
Carbon tetrachloride	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Chlorobenzene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Chloroethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<10 U
Chloroform	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Chloroprene	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
cis-1,2-Dichloroethylene	ug/l	<1 U	<1 U	<1 U	8	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	NT
cis-1,3-Dichloropropene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U

Table 4

Groundwater Sampling Results for Wells in Long Term Monitoring Program
DOT Parcel at Southeast Federal Center
Washington D.C.

CONSTITUENT	Sample Location / Sample Date / Sample Depth / UNITS	DOT-MW-1 4/22/04 30 Primary	DOT-MW-1 6/23/04 30 Primary	DOT-MW-1 12/20/04 30 Primary	DOT-MW-1 3/24/2005 30 Primary	DOT-MW-2D 2/26/04 35 Primary	DOT-MW-2D 6/23/04 35 Primary	DOT-MW-2D 6/23/04 35 Duplicate 1	DOT-MW-2D 10/1/04 35 Primary	DOT-MW-2D 3/24/2005 35 Primary	DOT-MW-2S 2/26/04 20 Primary	DOT-MW-3 2/26/04 25 Primary	DOT-MW-4 2/26/04 30 Primary	DOT-MW-4 6/23/04 30 Primary	DOT-MW-4 9/17/04 30 Primary	DOT-MW-4 12/20/04 30 Primary	DOT-MW-4 3/24/2005 30 Primary	F1-SB_MW01 2/1/02 15 Primary
Cyclohexane	ug/l	<5 U	<5 U	<5 U	<5 U	<100 U	260	230	<100 U	180	<100 U	<100 U	<1 U	<5 U	<5 U	<5 U	<5 U	NT
DBCP	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Dibromochloromethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Dichlorodifluoromethane	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
EDB	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Ethene, 1,2-dichloro-, E-	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Ethyl cyanide	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<10 U
Ethyl methacrylate	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
Ethylbenzene	ug/l	<1 U	<1 U	<1 U	<1 U	2,500	1,600	1,500	<20 U	1,200	3,300	3,500	3	<1 U	<1 U	<1 U	<1 U	<5 U
Freon 113	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	NT
Isobutylalcohol	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<40 U
m/p-xylene	ug/l	<2 U	<2 U	2	<2 U	5,000	2,800	2,700	3,000	4,700	11,000	9,500	10	<2 U	<2 U	<2 U	<2 U	NT
m-Dichlorobenzene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Methacrylonitrile	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<10 U
Methyl Acetate	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	NT
Methyl bromide	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<10 U
Methyl chloride	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<10 U
Methyl ethylketone	ug/l	<50 U	<50 U	<50 U	<50 U	<5,000 U	<500 U	<500 U	<1,000 U	<1,000 U	<5,000 U	<5,000 U	<50 U	<50 U	<50 U	<50 U	<50 U	<10 U
Methyl iodide	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
Methyl isobutyl ketone MIBK	ug/l	<10 U	<10 U	<10 U	<10 U	<1,000 U	<100 U	11 J	<200 U	<200 U	<1,000 U	<1,000 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Methyl methacrylate	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
Methylcyclohexane	ug/l	<5 U	<5 U	<5 U	<5 U	230	96	85	130	69 J	330	190	<1 U	<5 U	<5 U	<5 U	<5 U	NT
Methylene bromide	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
Methylene chloride	ug/l	<1 U	<1 U	<1 U	<1 U	180 B	<10 U	<10 U	<20 U	<20 U	<100 U	120 B	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Methyltert-butylether	ug/l	<1 U	11	4	4	<100 U	10	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	2	<2 U
Naphthalene	ug/l	<1 U	<1 U	<1 U	<1 U	NT	530	600	450	500	NT	NT	NT	<1 U	<1 U	<1 U	<1 U	NT
o-Dichlorobenzene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
o-Xylene	ug/l	<1 U	<1 U	1	<1 U	1,500	930	910	1,200	1,700	5,000	4,400	4	<1 U	<1 U	<1 U	<1 U	NT
p-Dichlorobenzene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Styrene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Tetrachloroethylene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Toluene	ug/l	<1 U	1	2	<1 U	6,100	4,200	4,200	3,300	1,800	43,000 E	6,800	6	<1 U	<1 U	<1 U	<1 U	<5 U
trans-1,3-Dichloropropene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
trans-1,4-Dichloro-2-butene	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
Trichloroethylene	ug/l	<1 U	<1 U	<1 U	<1 U	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Trichlorofluoromethane	ug/l	<5 U	<5 U	<5 U	<5 U	<100 U	<50 U	<50 U	<100 U	<100 U	<100 U	<100 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U
Vinyl Acetate	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U
Vinyl chloride	ug/l	<1 U	<1 U	<1 U	3	<100 U	<10 U	<10 U	<20 U	<20 U	<100 U	<100 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U
Xylene total	ug/l	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<5 U

a/ Wells BE-SB/MW06 and BE-SB/MW08 are not ir
B = Probable blank contamination
E = Estimated value
J = Estimated concentration
U = Analyzed for but not detected at the detection
NT = Not Tested

Table 4

Groundwater Sampling Results for Wells in Long Term Monitoring Program
DOT Parcel at Southeast Federal Center
Washington D.C.

	Sample Location	F1-SB_MW01	F1-SB_MW01	F1-SB_MW01	F1-SB_MW01	HMW-14	HMW-14	HMW-14	HMW-14	HMW-14	HMW-14	MW-21	MW-21	MW-21	MW-21	MW-21	MW-21
	Sample Date	4/1/02	7/9/02	11/11/03	6/22/04	6/26/04	9/17/04	9/17/04	12/20/04	3/24/2005	3/24/2005	11/11/03	6/22/04	9/17/04	12/20/04	12/20/04	3/23/2005
	Sample Depth	15	15	15	15	20	0	20	20	20	20	16	16	16	16	16	16
CONSTITUENT	UNITS	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate 1	Primary	Primary	Duplicate 1	Primary	Primary	Primary	Primary	Duplicate 1	Primary
1,1,1,2-Tetrachloroethane	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1,2,2-Tetrachloroethane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1,2-Trichloroethane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1-Dichloroethane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,1-Dichloroethylene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,2,3-Trichloropropane	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,2,4-Trichlorobenzene	ug/l	NT	NT	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,2-Dichloroethane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,2-Dichloropropane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,4-Dioxane	ug/l	<150 U	<150 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Hexanone	ug/l	<10 U	<10 U	<10 U	<10 U	<1,000 U	<1,000 U	<1,000 U	<100 U	<100 U	<200 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Acetone	ug/l	<10 U	<10 U	<10 U	<10 U	<1,000 U	<1,000 U	<1,000 U	<100 U	<100 U	<200 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Acetonitrile	ug/l	<20 U	<10 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Acrolein	ug/l	<20 U	<20 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Acrylonitrile	ug/l	<20 U	<20 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Allyl chloride	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Benzene	ug/l	<5 U	<5 U	2	<1 U	7,200	4,700	4,400	4,900	1,200	1,000	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Benzene, 1-methylethyl-	ug/l	NT	NT	<1 U	<1 U	180	110	110	130	65	55	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Bromodichloromethane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Bromoform	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Carbon disulfide	ug/l	<5 U	<5 U	<10 U	<10 U	<1,000 U	<1,000 U	<1,000 U	<100 U	<100 U	<200 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Carbon tetrachloride	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chlorobenzene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chloroethane	ug/l	<10 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chloroform	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Chloroprene	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
cis-1,2-Dichloroethylene	ug/l	NT	NT	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
cis-1,3-Dichloropropene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U

Table 4

Groundwater Sampling Results for Wells in Long Term Monitoring Program
DOT Parcel at Southeast Federal Center
Washington D.C.

	Sample Location	F1-SB_MW01	F1-SB_MW01	F1-SB_MW01	F1-SB_MW01	HMW-14	HMW-14	HMW-14	HMW-14	HMW-14	HMW-14	MW-21	MW-21	MW-21	MW-21	MW-21	MW-21
	Sample Date	4/1/02	7/9/02	11/11/03	6/22/04	6/26/04	9/17/04	9/17/04	12/20/04	3/24/2005	3/24/2005	11/11/03	6/22/04	9/17/04	12/20/04	12/20/04	3/23/2005
	Sample Depth	15	15	15	15	20	0	20	20	20	20	16	16	16	16	16	16
CONSTITUENT	UNITS	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate 1	Primary	Primary	Duplicate 1	Primary	Primary	Primary	Primary	Duplicate 1	Primary
Cyclohexane	ug/l	NT	NT	<1 U	<5 U	740	<500 U	<500 U	420	340	190	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U
DBCP	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Dibromochloromethane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Dichlorodifluoromethane	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
EDB	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Ethene, 1,2-dichloro-, E-	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Ethyl cyanide	ug/l	<10 U	<10 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Ethyl methacrylate	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Ethylbenzene	ug/l	<5 U	<5 U	<1 U	<1 U	3,800	2,400	2,200	2,600	680	540	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Freon 113	ug/l	NT	NT	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Isobutylalcohol	ug/l	<40 U	<40 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
m/p-xylene	ug/l	NT	NT	1 J	<2 U	5,400	3,200	3,000	5,200	780	600	<15 U	<2 U	<2 U	<2 U	<2 U	<2 U
m-Dichlorobenzene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Methacrylonitrile	ug/l	<10 U	<10 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Methyl Acetate	ug/l	NT	NT	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Methyl bromide	ug/l	<10 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Methyl chloride	ug/l	<10 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Methyl ethylketone	ug/l	<10 U	<10 U	<50 U	<50 U	<5,000 U	<5,000 U	<5,000 U	<500 U	<500 U	<1,000 U	<50 U	<50 U	<50 U	<50 U	<50 U	<50 U
Methyl iodide	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Methyl isobutyl ketone MIBK	ug/l	<10 U	<10 U	<10 U	<10 U	<1,000 U	<1,000 U	<1,000 U	<100 U	<100 U	<200 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Methyl methacrylate	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Methylcyclohexane	ug/l	NT	NT	<1 U	<5 U	400 J	270 J	260 J	190	240	180	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U
Methylene bromide	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Methylene chloride	ug/l	<5 U	<5 U	<1 U	<1 U	640 B	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 B
Methyltert-butylether	ug/l	<2 U	<2 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Naphthalene	ug/l	NT	NT	NT	<1 U	1,000	590	480	770	150	110	NT	<1 U	<1 U	<1 U	<1 U	<1 U
o-Dichlorobenzene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
o-Xylene	ug/l	NT	NT	<15 U	<1 U	210	220	210	420	38	29	<15 U	<1 U	<1 U	<1 U	<1 U	<1 U
p-Dichlorobenzene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Styrene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Tetrachloroethylene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Toluene	ug/l	<5 U	<5 U	<1 U	<1 U	580	480	460	590	57	45	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
trans-1,3-Dichloropropene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
trans-1,4-Dichloro-2-butene	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Trichloroethylene	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Trichlorofluoromethane	ug/l	<5 U	<5 U	<1 U	<5 U	<500 U	<500 U	<500 U	<50 U	<50 U	<100 U	<1 U	<5 U	<5 U	<5 U	<5 U	<5 U
Vinyl Acetate	ug/l	<5 U	<5 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Vinyl chloride	ug/l	<5 U	<5 U	<1 U	<1 U	<100 U	<100 U	<100 U	<10 U	<10 U	<20 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Xylene total	ug/l	<5 U	<15 U	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

a/ Wells BE-SB/MW06 and BE-SB/MW08 are not ir
B = Probable blank contamination
E = Estimated value
J = Estimated concentration
U = Analyzed for but not detected at the detection
NT = Not Tested

Table 5
Cleanup Criteria for Groundwater
DOT Parcel at Southeast Federal Center
Washington DC

Parameter	**Maximum Contaminant Levels ug/l**
Benzene	5
Toluene	1000
Ethylbenzene	700
Total Xylenes	10000
Chloroform	80 (a)
Cumene (1-Methylethylbenzene)	No MCL
1,4-Dichlorobenzene	75
Methyl-tert-butyl ether (MTBE)	20 (b)
Naphthalene	6.5 (c)
Trichloroethene	5

a/ MCL for total trihalomethanes, of which chloroform is one of several.
b/ Based on USEPA Drinking Water Advisory, December 1997
c/ EPA Region III Risk-Based Concentration for tap water.

Table 6

Summary of Groundwater Sampling and Analysis
Long Term Groundwater Treatment and Monitoring
Southeast Federal Center/ DOT Parcel
Washington DC

Purpose	Frequency	Monitoring Locations	Parameters	Analytical Method (a)	Investigative Samples	Matrix Duplicates	Matrix Spike/ Matrix Spike Duplicates (b)	Total
Monitoring of Upgradient Wells	Biannual	DOT-MW-1, DOT-MW-2S, DOT-MW-2D DOT-MW-3, MW-14	BTEX and MTBE Iron, total and ferrous Dissolved Oxygen Oxidation-Reduction Potential	8260B Colorimetric (Hach) Field Field	5	1	1	7
Monitoring of Downgradient Wells	Biannual until cleanup goals are met Annual after cleanup goals are met	DOT-MW-4, F1-SB/MW01, MW-21 BE-SB/MW04 (b)	BTEX and MTBE Iron, total and ferrous Dissolved Oxygen Oxidation-Reduction Potential	8260B Colorimetric (Hach) Field Field	4	0	0	4
New Monitoring Wells	To Be Determined	As needed to establish groundwater flow direction	BTEX, MTBE and Naphthalene Iron, total and ferrous Dissolved Oxygen Oxidation-Reduction Potential	8260B Colorimetric (Hach) Field Field	TBD	0	0	TBD
Investigation derived waste	One per sampling event	Liquid IDW containers	VOCs	8260B	TBD	0	0	TBD

a/ Methods from SW-846. The Target Compound List (TCL) will be used as the analyte list. Naphthalene will be included in the analyte list for 8260 analysis.
b/ Monitoring wells BE-SB/MW08 or BE-SB.MW02 may be used as substitutes for BE-SB/MW04.

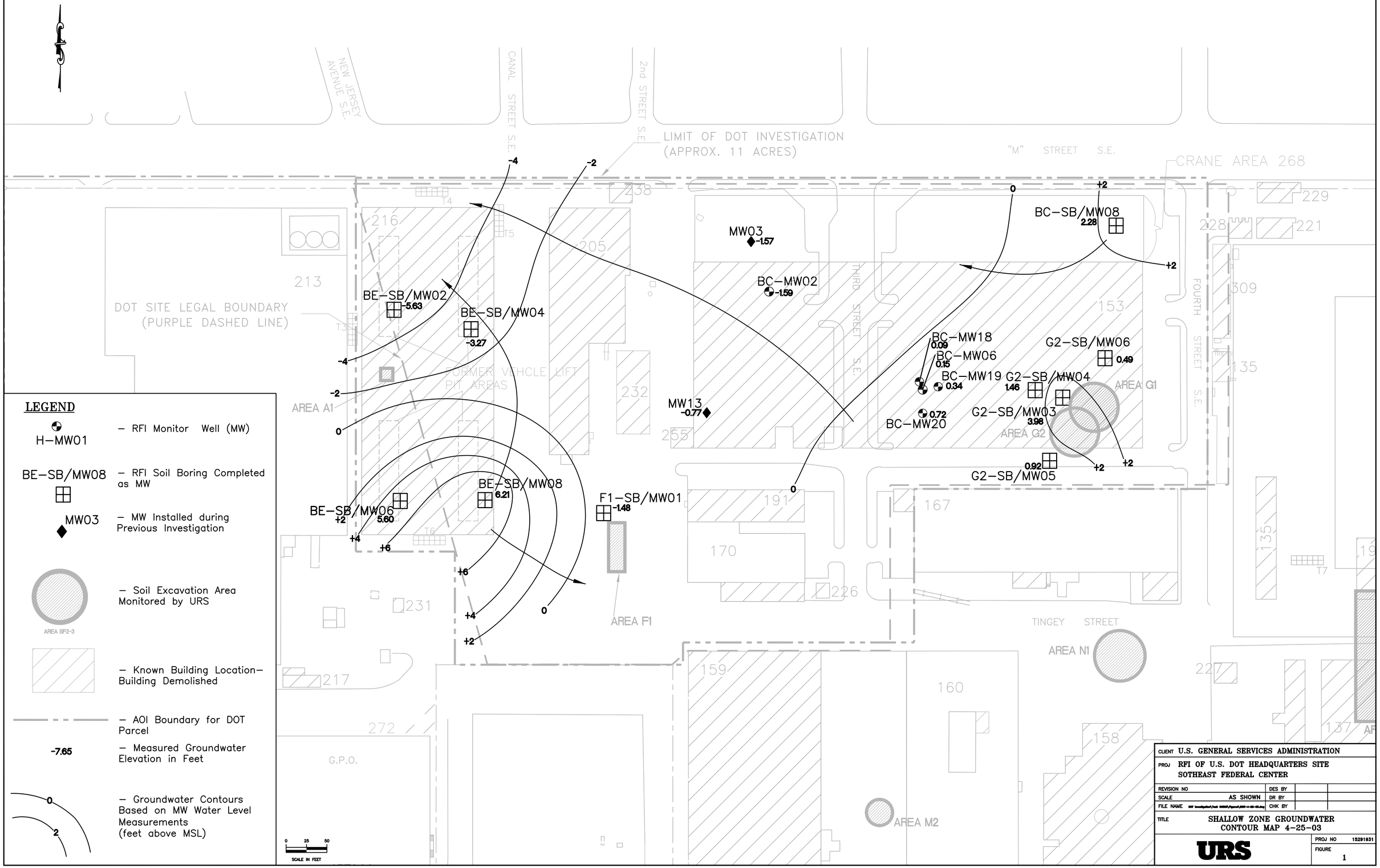
Table 7

Summary of Soil Sampling and Analysis
Long Term Groundwater Treatment and Monitoring
Southeast Federal Center/DOT Parcel
Washington DC

Purpose	Frequency / # of Samples	Parameters	Preparation Method (a)	Analytical Method (b)	Investigative Samples	Matrix Duplicates	Matrix Spike Duplicates (c)	Total
Waste Characterization of Drill Cuttings	1soil sample/5 drums	VOCs	5035	8260B	TBD	0	0	TBD
		SVOCs	3510C	8270C				
		RCRA Metals	3050B	6020B				
		PCBs	3510C	8082				

a/ Methods from SW-846.
b/ Methods from SW-846. The Target Compound List (TCL) will be used as the analyte list.
c/ MS/MSD samples will be collected for VOC analysis only.
TBD - To Be Determined

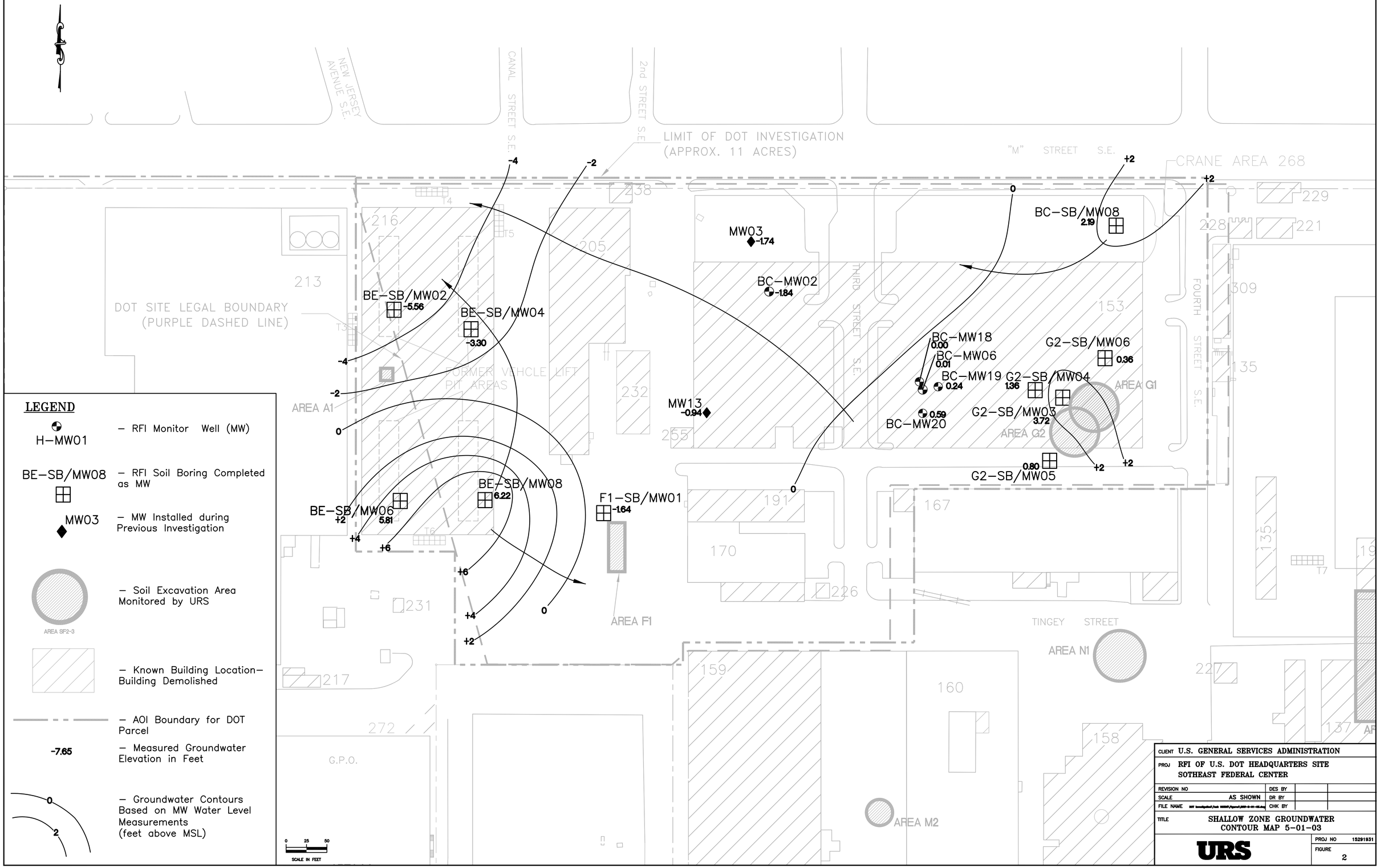
Appendix A – Shallow Zone Groundwater Contour Maps



LEGEND

- H-MW01 — RFI Monitor Well (MW)
- BE-SB/MW08 — RFI Soil Boring Completed as MW
- MW03 — MW Installed during Previous Investigation
- AREA SF2-3 — Soil Excavation Area Monitored by URS
- Known Building Location—Building Demolished
- AOI Boundary for DOT Parcel
- -7.65 — Measured Groundwater Elevation in Feet
- 0 / 2 — Groundwater Contours Based on MW Water Level Measurements (feet above MSL)

CLIENT	U.S. GENERAL SERVICES ADMINISTRATION
PROJ	RFI OF U.S. DOT HEADQUARTERS SITE SOTHEAST FEDERAL CENTER
REVISION NO	DES BY
SCALE AS SHOWN	DR BY
FILE NAME	CHK BY
TITLE	SHALLOW ZONE GROUNDWATER CONTOUR MAP 4-25-03
URS	PROJ NO 15291931
	FIGURE 1



CLIENT U.S. GENERAL SERVICES ADMINISTRATION

PROJ RFI OF U.S. DOT HEADQUARTERS SITE
SOTHEAST FEDERAL CENTER

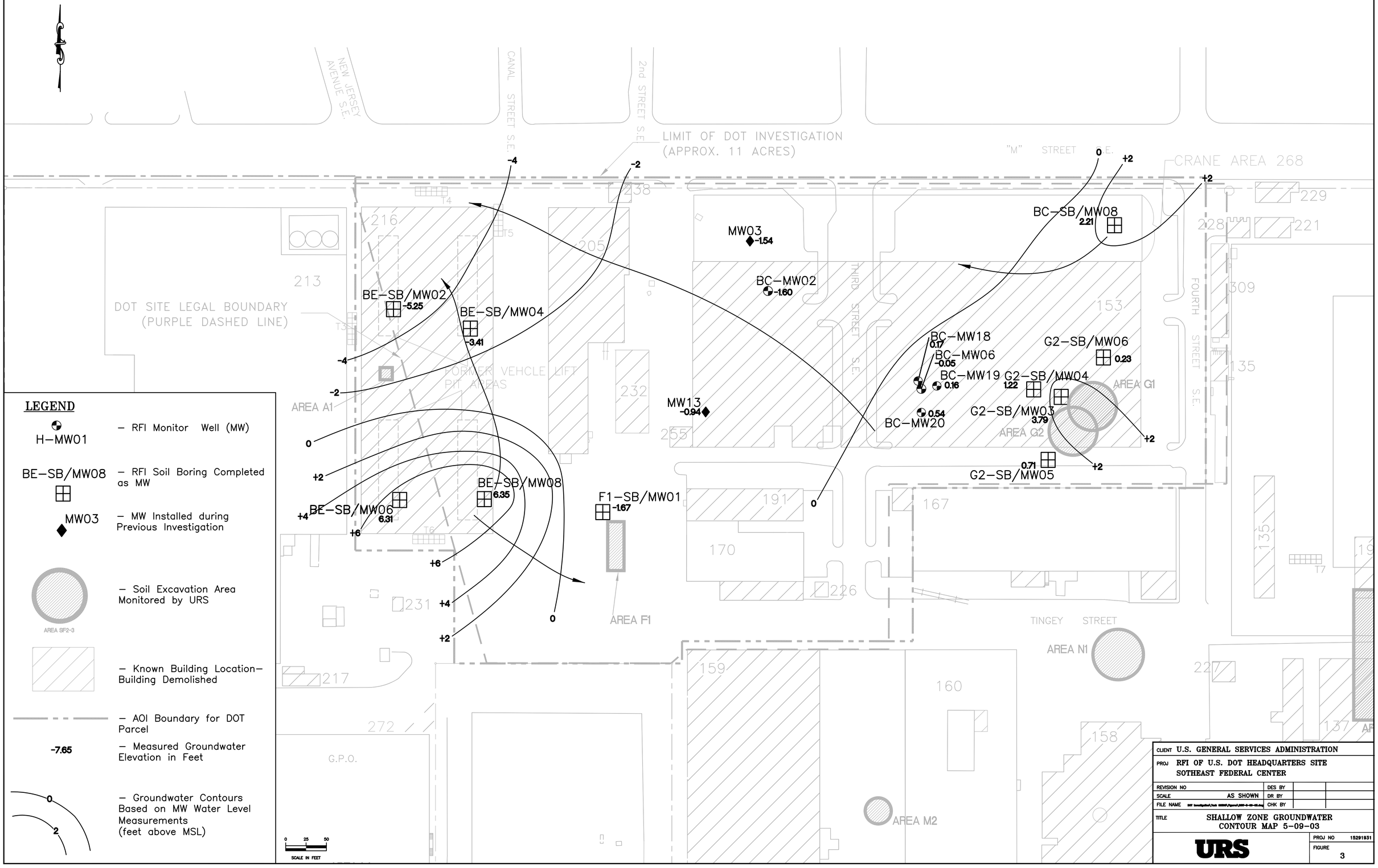
REVISION NO		DES BY	
SCALE	AS SHOWN	DR BY	
FILE NAME		CHK BY	

TITLE SHALLOW ZONE GROUNDWATER CONTOUR MAP 5-01-03

URS

PROJ NO 15291931

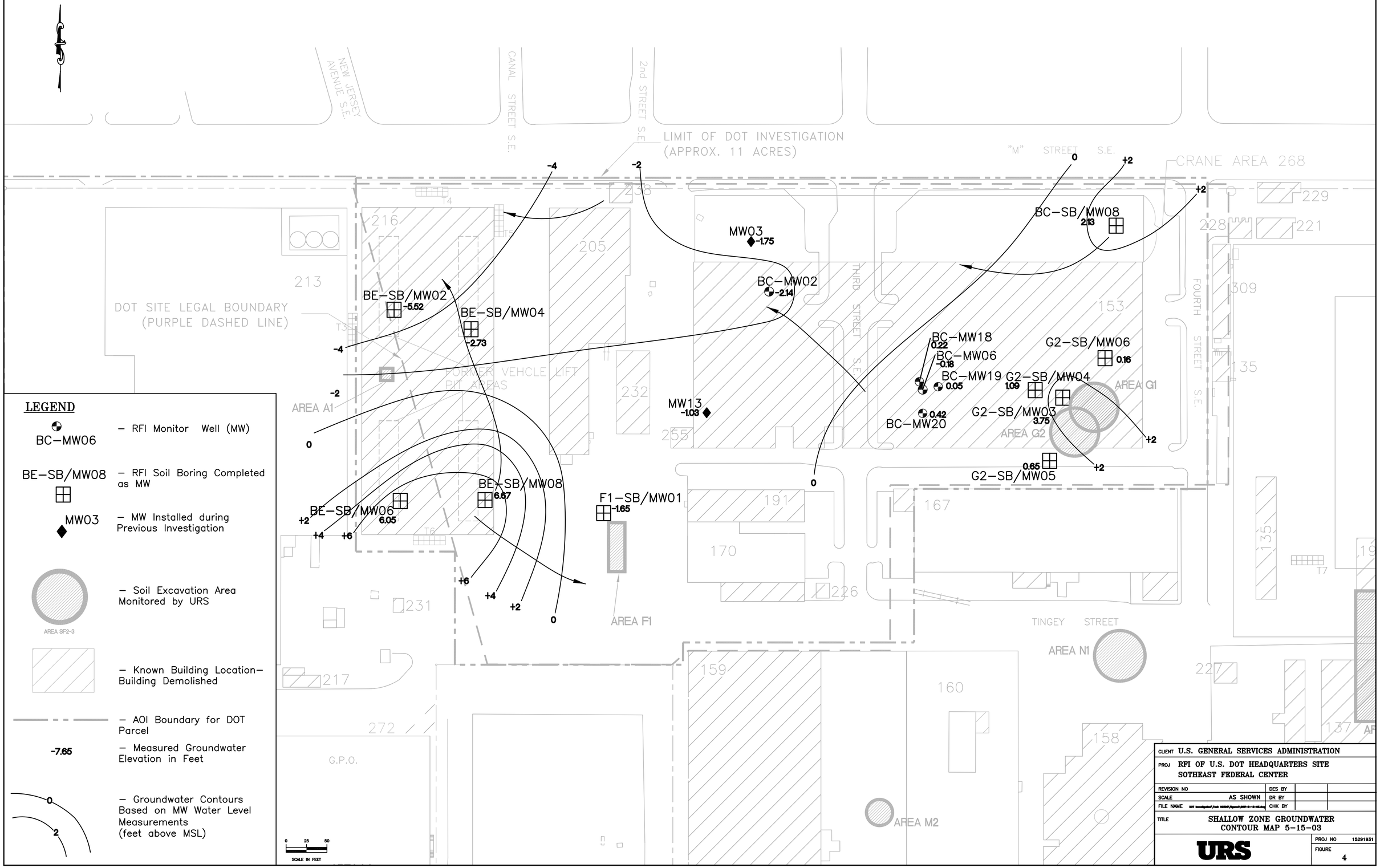
FIGURE 2



LEGEND

- H-MW01 — RFI Monitor Well (MW)
- BE-SB/MW08 — RFI Soil Boring Completed as MW
- MW03 — MW Installed during Previous Investigation
- AREA SF2-3 — Soil Excavation Area Monitored by URS
- Known Building Location—Building Demolished
- AOI Boundary for DOT Parcel
- -7.65 — Measured Groundwater Elevation in Feet
- 0 / 2 — Groundwater Contours Based on MW Water Level Measurements (feet above MSL)

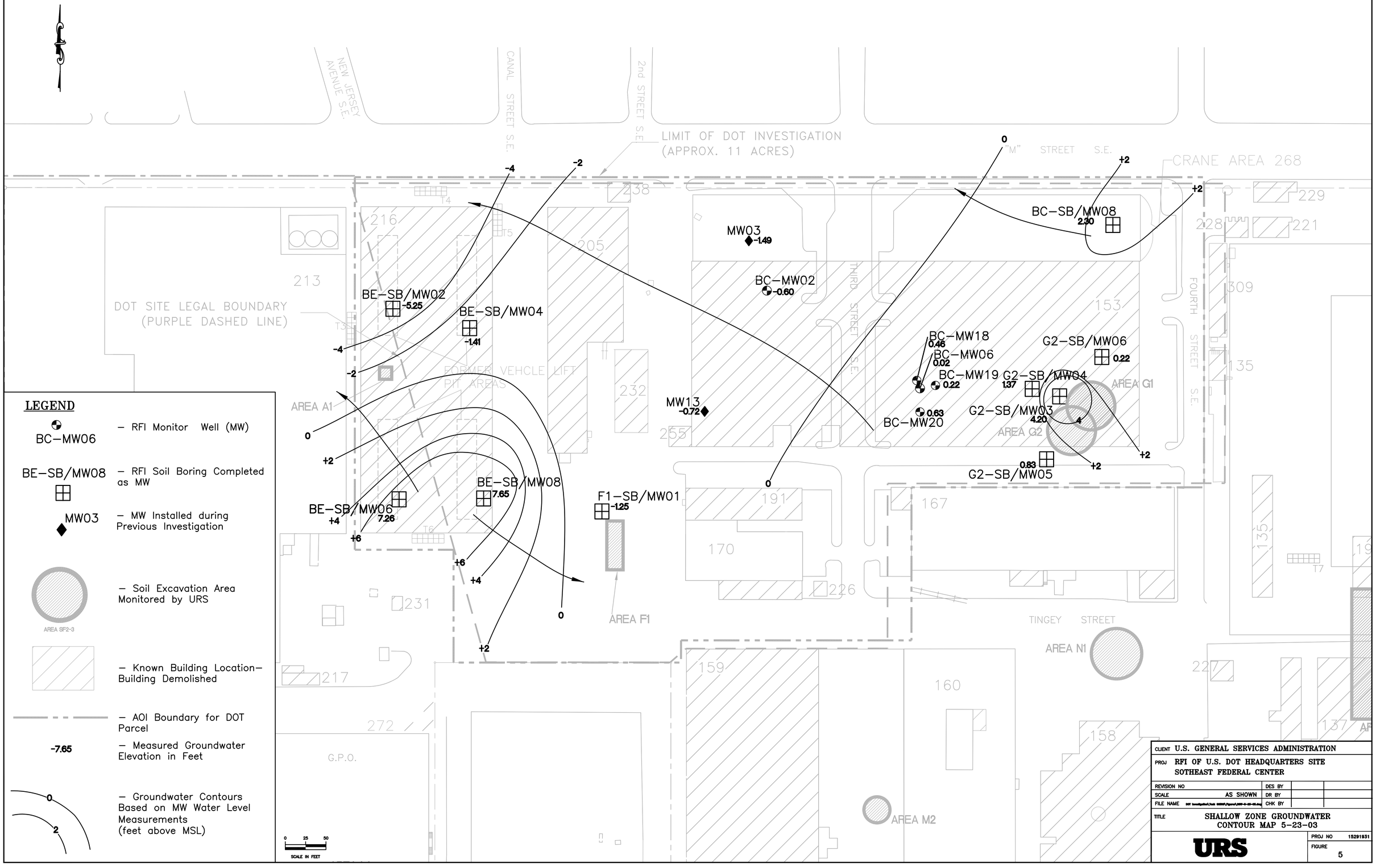
CLIENT	U.S. GENERAL SERVICES ADMINISTRATION
PROJ	RFI OF U.S. DOT HEADQUARTERS SITE SOTHEAST FEDERAL CENTER
REVISION NO	DES BY
SCALE AS SHOWN	DR BY
FILE NAME	CHK BY
TITLE	SHALLOW ZONE GROUNDWATER CONTOUR MAP 5-09-03
URS	PROJ NO 15291931
	FIGURE 3



LEGEND

- BC–MW06 — RFI Monitor Well (MW)
- BE–SB/MW08 — RFI Soil Boring Completed as MW
- MW03 — MW Installed during Previous Investigation
- AREA SF2-3 — Soil Excavation Area Monitored by URS
- Known Building Location–Building Demolished
- AOI Boundary for DOT Parcel
- -7.65 — Measured Groundwater Elevation in Feet
- 0 / 2 — Groundwater Contours Based on MW Water Level Measurements (feet above MSL)

CLIENT	U.S. GENERAL SERVICES ADMINISTRATION
PROJ	RFI OF U.S. DOT HEADQUARTERS SITE SOTHEAST FEDERAL CENTER
REVISION NO	DES BY
SCALE AS SHOWN	DR BY
FILE NAME	CHK BY
TITLE	SHALLOW ZONE GROUNDWATER CONTOUR MAP 5-15-03
URS	PROJ NO 15291931
	FIGURE 4



LEGEND

- BC–MW06 — RFI Monitor Well (MW)
- BE–SB/MW08 — RFI Soil Boring Completed as MW
- MW03 — MW Installed during Previous Investigation
- AREA SF2-3 — Soil Excavation Area Monitored by URS
- Known Building Location–Building Demolished
- AOI Boundary for DOT Parcel
- -7.65 — Measured Groundwater Elevation in Feet
- 0 / 2 — Groundwater Contours Based on MW Water Level Measurements (feet above MSL)

CLIENT	U.S. GENERAL SERVICES ADMINISTRATION
PROJ	RFI OF U.S. DOT HEADQUARTERS SITE SOTHEAST FEDERAL CENTER
REVISION NO	DES BY
SCALE AS SHOWN	DR BY
FILE NAME	CHK BY
TITLE	SHALLOW ZONE GROUNDWATER CONTOUR MAP 5–23–03
URS	PROJ NO 15291931
	FIGURE 5

Appendix B – ORC Advanced™ Material Safety Data Sheet

Oxygen Release Compound – Advanced (ORC Advanced™) MATERIAL SAFETY DATA SHEET (MSDS)

Last Revised: November 22, 2004

Section 1 - Material Identification

Supplier:

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Phone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of Calcium OxyHydroxide [CaO(OH)2], Calcium Hydroxide [Ca(OH)2], and Calcium Carbor (CaCO3)
Chemical Family:	Inorganic Chemical
Trade Name:	Advanced Formula Oxygen Release Compound (ORC Advanced™)
Product Use:	Used to remediate contaminated soil and groundwater (environmental applications)

Section 2 – Other Designations

CAS No.	*Chemical*
666235-17-2	(Hydrated) Calcium OxyHydroxide [CaO(OH)2]
666235-17-2	(Hydrated) Calcium Oxide Peroxide [CaO(OH)2]
1305-62-0	Calcium Hydroxide [Ca(OH) 2]
1317-65-3	Calcium Carbonate (CaCO3)

Regenesis - ORC Advanced MSDS

Section 3 – Physical Data

Form:	Powder
Color:	White to Pale Yellow
Odor:	Odorless
Melting Point:	527 °F (275 °C) - Decomposes
Boiling Point:	Not Applicable (NA)
Flammability/Flash Point:	NA
Auto- Flammability:	NA
Vapor Pressure:	NA
Self-Ignition Temperature:	NA
Thermal Decomposition:	527 °F (275 °C) - Decomposes
Bulk Density:	0.5 – 0.65 g/ml (Loose Method)
Solubility:	1.65 g/L @ 68° F (20° C) for calcium hydroxide.
Viscosity:	NA
pH:	11-13 (saturated solution)
Explosion Limits % by Volume:	Non-explosive
Hazardous Decomposition Products:	Oxygen, Hydrogen Peroxide, Steam, and Heat
Hazardous Reactions:	None

Section 4 – Reactivity Data

Stability: Stable under certain conditions (see below).
Conditions to Avoid: Heat and moisture.
Incompatibility: Acids, bases, salts of heavy metals, reducing agents, and flammable substances.
Hazardous Polymerization: Does not occur.
Regenesis - ORC Advanced MSDS

Section 5 - Regulations

TSCA Inventory List:	Listed
CERCLA Hazardous Substance (40 CFR Part 302)	
Listed Substance:	No
Unlisted Substance:	Yes
Reportable Quantity (RQ):	100 pounds
Characteristic(s):	Ignitibility
RCRA Waste Number:	D001
SARA, Title III, Sections 302/303 (40 CFR Part 355 – Emergency Planning and Notification)	
Extremely Hazardous Substance:	NO
SARA, Title III, Sections 311/312 (40 CFR Part 370 – Hazardous Chemical Reporting: Community Right-To-Know	
Hazard Category:	Immediate Health Hazard Fire Hazard
Threshold Planning Quantity:	10,000 pounds
SARA, Title III, Section 313 (40 CFR Part 372 – Toxic Chemical Release Reporting: Community Right-To-Know	
Extremely Hazardous Substance:	NO
WHMIS Classification:	C Oxidizing Material Poisonous and Infectious Material D Material Causing Other Toxic Effects Eye and Skin Irritant
Canadian Domestic Substance List:	Listed, DSL/NDSL Record Number - 39

This product has been classified in accordance with the hazard criteria of the Canadian Public Railway (CPR) and this MSDS contains all of the information required by the CPR.
Regenesis - ORC Advanced MSDS

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage: Keep in tightly closed container. Store in dry area, protected from heat sources and direct sunlight.

Handling: Clean and dry processing pipes and equipment before operation. Never return unused product to the storage container. Keep away from incompatible products. Containers and equipment used to handle this product should be used exclusively for this material. Avoid contact with water or humidity.

Personal Protective Equipment (PPE)

	Calcium Hydroxide	Calcium Carbonate
Engineering Controls:	ACGIH® TLV® (2000) 5 mg/m3 TWA OSHA PEL Total dust–15 mg/m3 TWA Respirable fraction– 5 mg/m3 TWA NIOSH REL (1994) 5 mg/m3	ACGIH® TLV® (2000) 10 mg/m3 TWA OSHA PEL Total dust–15 mg/m3 TWA Respirable fraction– 5 mg/m3 TWA NIOSH REL (1994) Total dust–10 mg/m3 TWA Respirable fraction- 5 mg/m3 TWA

Respiratory Protection: For many conditions, no respiratory protection may be needed; however, in dusty or unknown atmospheres use a NIOSH approved dust respirator.
Hand Protection: Impervious protective gloves made of nitrile, natural rubbber or neoprene.
Eye Protection: Use chemical safety goggles (dust proof).

Skin Protection: For brief contact, few precautions other than clean clothing are needed. Full body clothing impervious to this material should be used during prolonged exposure.

Regenesis - ORC Advanced MSDS

Section 6 – Protective Measures, Storage and Handling (cont)

Other:	Safety shower and eyewash stations should be present. Consultation with an industrial hygienist c safety manager for the selection of PPE suitable for working conditions is suggested.
Industrial Hygiene:	Avoid contact with skin and eyes.
Protection Against Fire & Explosion:	NA

Section 7 – Hazards Identification

Emergency Overview:	Oxidizer – Contact with combustibles may cause a fire. This material decomposes and releases oxygen in fire. The additional oxygen may intensify the fire.
Potential Health Effects:	Irritating to the mucous membrane and eyes. If the product splashes in ones face and eyes, treat the eyes Do not dry soiled clothing close to an open flame or heat source. Any clothing that has been contaminated this product should be submerged in water prior to drying.
Inhalation:	High concentrations may cause slight nose and throat irritation with a cough. There is risk of sore throat an nose bleeds if one is exposed to this material for an extended period of time.
Eye Contact:	Severe eye irritation with watering and redness. There is also the risk of serious and/or permanent eye lesi
Skin Contact:	Irritation may occur if one is exposed to this material for extended periods.
Ingestion:	Irritation of the mouth and throat with nausea and vomiting.

Regenesis - ORC Advanced MSDS

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage/Gas Leakage:	Collect in suitable containers. Wash remainder with copious quantities of water.
Extinguishing Media:	See next.
Suitable:	Large quantities of water or water spray. In case of fire in close proximity, all means of extinguisl are acceptable.
Further Information:	Self contained breathing apparatus or approved gas mask should be worn due to small particle s Use extinguishing media appropriate for surrounding fire. Apply cooling water to sides of transpo storage vessels that are exposed to flames until the fire is extinguished. Do not approach hot ves that contain this product.
First Aid:	After contact with skin, wash immediately with plenty of water and soap. In case of contact with e rinse immediately with plenty of water and seek medical attention. Consult an opthalmologist in a cases.
Eye Contact:	Flush eyes with running water for 15 minutes, while keeping the eyelids wide open. Consult with ophthalmologist in all cases.
Inhalation:	Remove subject from dusty environment. Consult with a physician in case of respiratory symptor
Ingestion:	If the victim is conscious, rinse mo uth and admnister fresh water. DO NOT induce vomiting. Cor a physician in all cases.
Skin Contact:	Wash affected skin with running water. Remove and clean clothing. Consult with a physician in c of persistent pain or redness.
Special Precautions:	Evacuate all non-essential personnel. Intervention should only be done by capable personnel tha trained and aware of the hazards associated with this product. When it is safe, unaffected produ should be moved to safe area.

Regenesis - ORC Advanced MSDS

Section 8 – Measures in Case of Accidents and Fire (cont)

Specific Hazards:	Oxidizing substance. Oxygen released on exothermic decomposition may support combustion. Confined space and/or containers may be subject to increased pressure. If product comes into contact with flammables, fire or explosion may occur.

Section 9 – Accidental Release Measures

Precautions: Observe the protection methods cited in Section 3. Avoid materials and products that are incompatible with product. Immediately notify the appropriate authorities in case of reportable discharge (> 100 lbs).

Cleanup Methods: Collect the product with a suitable means of avoiding dust formation. All receiving equipment should be clean vented, dry, labeled and made of material that this product is compatible with. Because of the contamination the collected material should be kept in a safe isolated place. Use large quantities of water to clean the impac area. See Section 12 for disposal methods.

Section 10 – Information on Toxicology

Toxicity Data

Acute Toxicity: Oral Route, LD50, rat, > 2,000 mg/kg (powder 50%) Dermal Route, LD50, rat, > 2,000 mg/kg (powder 5(Inhalation, LD50, rat, > 5,000 mg/m3 (powder 35%)

Irritation: Rabbit (eyes), severe irritant

Sensitization: No data

Chronic Toxicity: In vitro, no mutagenic effect (Powder 50%)

Target Organ Effects: Eyes and respiratory passages.

Regenesis - ORC Advanced MSDS

Section 10 – Information on Toxicology

Ecology Data

Acute Exotoxicity:

10 mg Ca(OH)2/L: pH = 9.0
100 mg Ca(OH)2/L: pH = 10.6
Fishes, Cyprinus carpio, LC50, 48 hrs, 160 mg/L
Crustaceans, Daphnia sp., EC50, 24 hours, 25.6 mg/L
(Powder 16%)

Mobility: Low Solubility and Mobility
Water – Slow Hydrolysis.
Degradation Products: Calcium Hydroxide

Abiotic Degradation: Water/soil – complexation/precipitation. Carbonates/sulfates present at environmental concentrations.
Degradation products: carbonates/sulfates sparingly soluble

Biotic Degradation: NA (inorganic compound)

Potential for Bioaccumulation: NA (ionizable inorganic compound)

Comments: Observed effects are related to alkaline properties of the product. Hazard for the environment is limited due to the product properties of:

- No bioaccumulation
- Weak solubility and precipatation as carbonate or sulfate in an aquatic environment.

Diluted product is rapidly neutralized at environmental pH.

Further Information: NA

Regenesis - ORC Advanced MSDS

Section 12 – Disposal Considerations

Waste Disposal Method: Consult current federal, state and local regulations regarding the proper disposal of this material and it emptied containers.

Section 13 – Shipping/Transport Information

D.O.T Shipping Name: 5.1 Oxidizer N.O.S

UN Number: UN 1479

Hazard Class: 5.1
Label(s): 5.1 (Oxidizer)
Packaging Group: II
STCC Number: 4918717

Section 14 – Other Information

HMIS® Rating
Health – 2 Reactivity – 1
Flammability – 0 PPE - Required

HMIS® is a registered trademark of the National Painting and Coating Association.

NFPA® Rating
Health – 2 Reactivity – 1
Flammability – 0 OX

NFPA® is a registered trademark of the National Fire Protection Association.

Reason for Issue: Update toxicological and ecological data

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provide without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of materi The items in this document are subject to change and clarification as more information become available.

Appendix C – ORC Advanced™ Design Software for Barriers Using Slurry Injection

ORC *Advanced* Design Software for Barriers Using Slurry Injection

August 2004

Regenesis Technical Support, USA (949) 366-8000 www.regenesis.com

Site Name: DOT Parcel, DOT-MW-1 (6/23/04 sample data)
Location: Washington DC
Consultant: Environmental Strategies

Estimated Plume Requiring Treatment

Width of plume (intersecting gw flow direction)	100	ft		
Depth to contaminated zone	18	ft		
Thickness of contaminated saturated zone	15	ft		
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	silty sand			
Effective porosity	0.35			
Hydraulic conductivity	4.3	ft/day	1.5E-03	cm/sec
Hydraulic gradient	0.01	ft/ft		
Seepage velocity	44.8	ft/yr	0.123	ft/day

Dissolved Phase Oxygen Demand: Individual species that represent oxygen demand:	Contaminant Conc. (mg/L)	Contaminant Loading (lb)	Stoichiometry (wt/wt) O_2/contam.	ORC-Adv Dose (lb)
Benzene	0.01	0.02	3.1	0
Toluene	0.00	0.00	3.1	0
Ethylbenzene	0.00	0.00	3.2	0
Xylenes	0.00	0.00	3.2	0
MTBE	0.01	0.02	2.7	0
cis-1,2-DCE	0.00	0.00	0.7	0
Vinyl Chloride	0.00	0.00	0.0	0
Naphthalene	0.00	0.00	3.0	0
User added, add stoichiometric demand (see pull-down)	0.00	0.00	0.0	0
Reduced metals: Fe^{+2} and Mn^{+2}	15.25	22.40	0.1	13
<- pull-down menu				
Measures of total oxygen demand				
Total Petroleum Hydrocarbons	0.00	0.00	3.1	0
Biological Oxygen Demand (BOD)	0.00	0.00	1.0	0
Chemical Oxygen Demand (COD)	0.00	0.00	1.0	0

Length of time to evaluate contaminant flow into barrier: 1 yr

Summary of Estimated ORC-Adv Requirement Measures		Dissolved Phase ORC-Adv Demand (lbs)	Additional Demand Factor (1 to 10x)	Total ORC-Adv Demand (lbs)	ORC-Adv Cost	
Total BTEX, MTBE, etc.	◉	14	5.0	70	$671	<-
Total Petroleum Hydrocarbons	○	0	2.0	0	$0	
Biological Oxygen Demand (BOD)	○	0	2.0	0	$0	
Chemical Oxygen Demand (COD)	○	0	1.5	0	$0	

Required ORC-Adv quantity (in 25 lb increments) ----------> 75 lbs ORC-Adv

Delivery Design for ORC-Adv Slurry

Spacing within rows (ft) Consider tighter spacing	20.0	feet	
Number of points per row	5	points/row	
Number of rows	2.0	rows	
Total number of points	10	points	
ORC-Adv application rate Minimum Dose Override->	3.0	lbs/foot	
Total ORC-Adv required Minimum Dose Override->	450	lbs of ORC-Adv	

Slurry Mixing Volume for Injections

Pounds per location	45	pounds
Buckets per location	1.8	buckets
Design solids content (20-40% by wt. for injections)	30%	
Volume of water required per hole (gal)	13	gallons
Total water for mixing all holes (gal)	126	gallons
Simple ORC-Adv Backfilling: min hole diameter for 67% slurry	2.9	inches
Feasibility for slurry injection in sand: ok up to 15 lb/ft	(ok)	
Feasibility for slurry injection in silt: ok up to 10 lb/ft	(ok)	
Feasibility for slurry injection in clay: ok up to 10 lb/ft	(ok)	

Project Summary

Number of ORC-Adv delivery points (adjust as necessary for site)		10
ORC-Adv application rate in lbs/ft (adjust as necessary for site)		3.0 <-Minimum Dose Override
ORC-Adv bulk material for slurry injection (lbs)		450
Number of 25 lb ORC-Adv buckets		18.0
ORC-Adv bulk material cost	$	8.95
Cost for bulk ORC-Adv material	$	4,028
Shipping and Tax Estimates in US Dollars		
Sales Tax rate: 0.00%	$	-
Total Material Cost	$	4,028
Shipping (call for amount)	$	-
Total Regenesis Material Cost	$	4,028

ORC-Adv Slurry Injection Cost Estimate (responsibility of customer to contract work)

Footage for each point = uncontaminated interval + ORC-Adv injection interval (		33
Total length for direct push for project (ft)		330
Estimated daily installation rate (ft per day: 300 for push, 150 for drilling)		300
Estimated points per day (10 to 30 is typical for direct push)		9.1
Required number of days		2
Mob/demob cost for injection subcontractor	$	400
Daily rate for injection subcontractor ($1-2K for push, $3-4K for drill rig)	$	1,500
Total injection subcontrator cost for application	$	3,400
Total Install Cost (not including consultant, lab, etc.)	$	7,428

Other Project Cost Estimates

Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	$	7,428

ORC *Advanced* Design Software for Barriers Using Slurry Injection

August 2004

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

Site Name: DOT Parcel, DOT-MW-3 (2/26/04 sample data)
Location: Washington DC
Consultant: Environmental Strategies

Estimated Plume Requiring Treatment

Width of plume (intersecting gw flow direction)	100	ft		
Depth to contaminated zone	18	ft		
Thickness of contaminated saturated zone	15	ft		
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	silty sand			
Effective porosity	0.35			
Hydraulic conductivity	4.3	ft/day	1.5E-03	cm/sec
Hydraulic gradient	0.01	ft/ft		
Seepage velocity	44.8	ft/yr	0.123	ft/day

Dissolved Phase Oxygen Demand: Individual species that represent oxygen demand:	Contaminant Conc. (mg/L)	Contaminant Loading (lb)	Stoichiometry (wt/wt) O_2/contam.	ORC-Adv Dose (lb)
Benzene	2.90	4.26	3.1	78
Toluene	6.80	9.99	3.1	183
Ethylbenzene	3.50	5.14	3.2	97
Xylenes	13.90	20.41	3.2	385
MTBE	0.05	0.07	2.7	1
cis-1,2-DCE	0.00	0.00	0.7	0
Vinyl Chloride	0.00	0.00	0.0	0
Naphthalene	0.10	0.15	3.0	3
User added, add stoichiometric demand (see pull-down)	0.00	0.00	0.0	0
Reduced metals: Fe^{+2} and Mn^{+2}	10.00	14.69	0.1	9
<- pull-down menu				
Measures of total oxygen demand				
Total Petroleum Hydrocarbons	0.00	0.00	3.1	0
Biological Oxygen Demand (BOD)	0.00	0.00	1.0	0
Chemical Oxygen Demand (COD)	0.00	0.00	1.0	0

Length of time to evaluate contaminant flow into barrier: 1 yr

Summary of Estimated ORC-Adv Requirement Measures		Dissolved Phase ORC-Adv Demand (lbs)	Additional Demand Factor (1 to 10x)	Total ORC-Adv Demand (lbs)	ORC-Adv Cost	
Total BTEX, MTBE, etc.	(•)	755	5.0	3,777	$32,300	<-
Total Petroleum Hydrocarbons	( )	0	2.0	0	$0	
Biological Oxygen Demand (BOD)	( )	0	2.0	0	$0	
Chemical Oxygen Demand (COD)	( )	0	1.5	0	$0	

Required ORC-Adv quantity (in 25 lb increments) ----------> 3,800 lbs ORC-Adv

Delivery Design for ORC-Adv Slurry

Spacing within rows (ft)	10.0	feet
Number of points per row	10	points/row
Number of rows	2.0	rows
Total number of points	20	points
ORC-Adv application rate	12.7	lbs/foot
Total ORC-Adv required	3,800	lbs of ORC-Adv

Slurry Mixing Volume for Injections

Pounds per location	190	pounds
Buckets per location	7.6	buckets
Design solids content (20-40% by wt. for injections)	30%	
Volume of water required per hole (gal)	53	gallons
Total water for mixing all holes (gal)	1063	gallons
Simple ORC-Adv Backfilling: min hole diameter for 67% slurry	5.9	inches
Feasibility for slurry injection in sand: ok up to 15 lb/ft	(ok)	
Feasibility for slurry injection in silt: ok up to 10 lb/ft	(call Regenesis)	
Feasibility for slurry injection in clay: ok up to 10 lb/ft	(call Regenesis)	

Project Summary		
Number of ORC-Adv delivery points (adjust as necessary for site)		20
ORC-Adv application rate in lbs/ft (adjust as necessary for site)		12.7
ORC-Adv bulk material for slurry injection (lbs)		3800
Number of 25 lb ORC-Adv buckets		152.0
ORC-Adv bulk material cost	$	8.50
Cost for bulk ORC-Adv material	$	32,300
Shipping and Tax Estimates in US Dollars		
Sales Tax rate: 0.00%	$	-
Total Material Cost	$	32,300
Shipping (call for amount)	$	-
Total Regenesis Material Cost	$	32,300

ORC-Adv Slurry Injection Cost Estimate (responsibility of customer to contract work)		
Footage for each point = uncontaminated interval + ORC-Adv injection interval (		33
Total length for direct push for project (ft)		660
Estimated daily installation rate (ft per day: 300 for push, 150 for drilling)		300
Estimated points per day (10 to 30 is typical for direct push)		9.1
Required number of days		3
Mob/demob cost for injection subcontractor	$	400
Daily rate for injection subcontractor ($1-2K for push, $3-4K for drill rig)	$	1,500
Total injection subcontrator cost for application	$	4,900
Total Install Cost (not including consultant, lab, etc.)	$	37,200

Other Project Cost Estimates		
Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	$	37,200

ORC *Advanced* Design Software for Barriers Using Slurry Injection

August 2004

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

Site Name: DOT Parcel, DOT-MW-2S and DOT-MW-2D (2/26/04 sample data)
Location: Washington DC
Consultant: Environmental Strategies

Estimated Plume Requiring Treatment

Width of plume (intersecting gw flow direction)	100	ft		
Depth to contaminated zone	18	ft		
Thickness of contaminated saturated zone	15	ft		
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	silty sand			
Effective porosity	0.35			
Hydraulic conductivity	4.3	ft/day	1.5E-03	cm/sec
Hydraulic gradient	0.01	ft/ft		
Seepage velocity	44.8	ft/yr	0.123	ft/day

Dissolved Phase Oxygen Demand: Individual species that represent oxygen demand:	Contaminant Conc. (mg/L)	Contaminant Loading (lb)	Stoichiometry (wt/wt) O_2/contam.	ORC-Adv Dose (lb)
Benzene	20.80	30.55	3.1	559
Toluene	24.55	36.05	3.1	659
Ethylbenzene	2.90	4.26	3.2	80
Xylenes	11.25	16.52	3.2	312
MTBE	0.05	0.07	2.7	1
cis-1,2-DCE	0.00	0.00	0.7	0
Vinyl Chloride	0.00	0.00	0.0	0
Naphthalene	0.00	0.00	3.0	0
User added, add stoichiometric demand (see pull-down)	0.00	0.00	0.0	0
Reduced metals: Fe^{+2} and Mn^{+2}	55.00	80.77	0.1	48
	<- pull-down menu			
Measures of total oxygen demand				
Total Petroleum Hydrocarbons	0.00	0.00	3.1	0
Biological Oxygen Demand (BOD)	0.00	0.00	1.0	0
Chemical Oxygen Demand (COD)	0.00	0.00	1.0	0

Length of time to evaluate contaminant flow into barrier: 1 yr

Summary of Estimated ORC-Adv Requirement Measures		Dissolved Phase ORC-Adv Demand (lbs)	Additional Demand Factor (1 to 10x)	Total ORC-Adv Demand (lbs)	ORC-Adv Cost	
Total BTEX, MTBE, etc.	(•)	1,659	5.0	8,296	$68,475	<-
Total Petroleum Hydrocarbons	( )	0	2.0	0	$0	
Biological Oxygen Demand (BOD)	( )	0	2.0	0	$0	
Chemical Oxygen Demand (COD)	( )	0	1.5	0	$0	

Required ORC-Adv quantity (in 25 lb increments) ----------> 8,300 lbs ORC-Adv

Delivery Design for ORC-Adv Slurry

Spacing within rows (ft)	10.0	feet
Number of points per row	10	points/row
Number of rows	2.0	rows
Total number of points	20	points
ORC-Adv application rate	27.7	lbs/foot
Total ORC-Adv required	8,300	lbs of ORC-Adv

Slurry Mixing Volume for Injections

Pounds per location	415	pounds
Buckets per location	16.6	buckets
Design solids content (20-40% by wt. for injections)	30%	
Volume of water required per hole (gal)	116	gallons
Total water for mixing all holes (gal)	2322	gallons
Simple ORC-Adv Backfilling: min hole diameter for 67% slurry	8.7	inches
Feasibility for slurry injection in sand: ok up to 15 lb/ft	(call Regenesis)	
Feasibility for slurry injection in silt: ok up to 10 lb/ft	(call Regenesis)	
Feasibility for slurry injection in clay: ok up to 10 lb/ft	(call Regenesis)	

Project Summary

Number of ORC-Adv delivery points (adjust as necessary for site)		20
ORC-Adv application rate in lbs/ft (adjust as necessary for site)		27.7
ORC-Adv bulk material for slurry injection (lbs)		8300
Number of 25 lb ORC-Adv buckets		332.0
ORC-Adv bulk material cost	$	8.25
Cost for bulk ORC-Adv material	$	68,475
Shipping and Tax Estimates in US Dollars		
Sales Tax rate: 0.00%	$	-
Total Material Cost	$	68,475
Shipping (call for amount)	$	-
Total Regenesis Material Cost	$	68,475

ORC-Adv Slurry Injection Cost Estimate (responsibility of customer to contract work)

Footage for each point = uncontaminated interval + ORC-Adv injection interval (		33
Total length for direct push for project (ft)		660
Estimated daily installation rate (ft per day: 300 for push, 150 for drilling)		300
Estimated points per day (10 to 30 is typical for direct push)		9.1
Required number of days		3
Mob/demob cost for injection subcontractor	$	400
Daily rate for injection subcontractor ($1-2K for push, $3-4K for drill rig)	$	1,500
Total injection subcontrator cost for application	$	4,900
Total Install Cost (not including consultant, lab, etc.)	$	73,375

Other Project Cost Estimates

Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	$	73,375

Appendix D – Injection Well Inventory for March 2004 ORC® Injection

Type or print all information. See reverse for instructions.

OMB No. 2040-0042 Approval Expires 1/31/05

INVENTORY OF INJECTION WELLS

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF GROUND WATER AND DRINKING WATER

(This information is collected under the authority of the Safe Drinking Water Act)

1. DATE PREPARED *(Year, Month, Day)*: YR 04 MO 02 DY 20

2. FACILITY ID NUMBER: DCG

3. TRANSACTION TYPE *(Please mark one of the following)*

- ☐ Deletion
- ☑ First Time Entry
- ☐ Entry Change
- ☐ Replacement

4. FACILITY NAME AND LOCATION

A. NAME *(last, first, and middle initial)*: DOT Parcel - Southeast Federal Center

B. STREET ADDRESS/ROUTE NUMBER: 3rd and M Street, S.E.

C. LATITUDE: DEG 38 MIN 52 SEC 33.

D. LONGITUDE: DEG 077 MIN 00 SEC 14.

E. TOWNSHIP/RANGE: TOWNSHIP | RANGE | SECT | 1/4 SECT

F. CITY/TOWN: Washington, DC

G. STATE: DC

H. ZIP CODE: 20374

I. NUMERIC COUNTY CODE:

J. INDIAN LAND *(mark "x")*: ☐ Yes ☑ No

5. LEGAL CONTACT:

A. TYPE *(mark "x")*: ☐ Owner ☑ Operator

B. NAME *(last, first, and middle initial)*: Sarr, David

C. PHONE *(area code and number)*: 703 709 6500

D. ORGANIZATION: Environmental Strategies Consulting LLC

E. STREET/P.O. BOX: 11911 Freedom Drive, Suite 900

F. CITY/TOWN: Reston

G. STATE: VA

H. ZIP CODE: 20190

I. OWNERSHIP *(mark "x")*: ☐ PRIVATE ☐ PUBLIC ☐ SPECIFY OTHER ☐ STATE ☐ FEDERAL

6. WELL INFORMATION:

A. CLASS AND TYPE		B. NUMBER OF WELLS: COMM	B. NUMBER OF WELLS: NON-COMM	C. TOTAL NUMBER OF WELLS	D. WELL OPERATION STATUS: UC	AC	TA	PA	AN
5			40	40	40				

COMMENTS *(Optional)*:

Forty temporary injection wells used to release Oxygen Release Compound (ORC) into the subsurface as an aid to groundwater remediation on the facility.

KEY:

DEG = Degree
MIN = Minute
SEC = Second
SECT = Section
1/4 SECT = Quarter Section

COMM = Commercial
NON-COMM = Non-Commercial
AC = Active
UC = Under Construction
TA = Temporarily Abandoned
PA = Permanently Abandoned and Approved by State
AN = Permanently Abandoned and not Approved by State